BAY AREA FARMLAND LOSS: Trends and Case Studies

Background Report #4

POS Farmlands Conservation Project
January, 1980

PEOPLE FOR OPEN SPACE
San Francisco, California

The POS Farmlands Project is a two-year study of agriculture in the Bay Area and what should be done to protect it. The project has been supported by grants from the Packard, Gerbode, Columbia, and Haas foundations, and was begun in February, 1979.

This report is the fourth of a series of six background reports to be produced in the course of the project. Future reports include #2 Functions of Farmland, #3 Agricultural Production Issues, #5 Recommendations and #6 Impacts of Farmland Protection. Bkg. Rept. #1, A Description of Bay Area Farmland, has been completed and is available from the POS office; a contribution of $4 is requested for direct costs. From these background reports, a final report will be prepared and published in late 1980.

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INTRODUCTION

This is the fourth background report of the People for Open Space (POS) Farmlands Project (although it is being issued second in order). It has been prepared to describe farmland loss in the Bay Area, the process by which it occurs, and what future farmland loss is likely to be. The first three in this series of background reports describe agriculture in the Bay Area (#1), the benefits it provides the region (#2), and the production issues it faces (#3). Additional reports will be prepared on ways of protecting the Bay Area's agricultural land, and the impacts of doing so.

Farmland Loss was prepared by POS Research Associate Pamela Westing, with research assistance from Glenn Christ. It is based on both existing studies and reports and on original research. The California Department of Water Resources generously supplied much of the original data used in many of the land loss calculations. A preliminary draft of this report was reviewed by a number of persons including: Darwyn H. Briggs of the U.S.D.A. in Washington, D.C.; Dennis Barry of the Contra Costa County Planning Dept.; Tim Caulkins of the Solano County Planning Dept.; Charles Q. Forester, ABAG Planning Director; Jack Liebster of the Calif. Coastal Commission; Charles Little of the American Land Forum; George K. Sato of the Dept. of Water Resources, Central Division; and Kathryn Zeimetz of the U.S.D.A. In addition, POS consultants L. T. Wallace of the U.C. Cooperative Extension and Robert Twiss of the U.C. Landscape Architecture Dept. provided many helpful comments and recommendations. Finally, we wish to offer special thanks to Roberta Mundie of Gruen Gruen + Assocs. for her extremely helpful reviews. There were also a number of other persons who assisted with information and who we are not able to cite due to confidentiality.

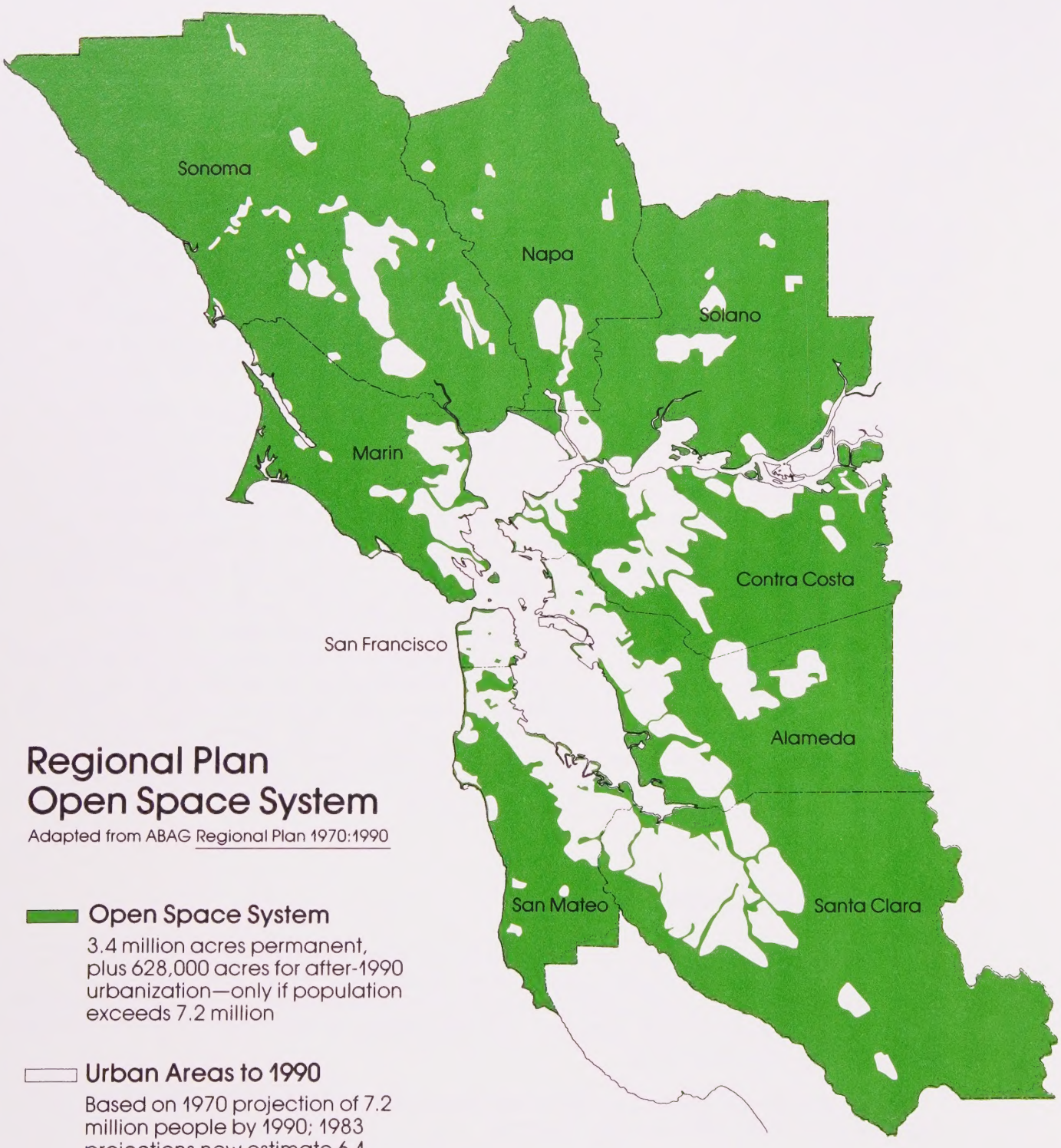
The POS Farmlands Project

The Farmlands Project is a two-year program aimed at documenting the reasons for preserving agricultural land in the Bay Area, recommending a program for doing so, and providing technical assistance to citizens working on farmlands preservation efforts. It was begun in February of 1979, and will be completed in early 1981.

The following questions form the basis for a series of six background reports, of which this is the fourth:

1. What is agriculture in the nine-county Bay Area?
2. What are the functions of the region's farmlands?
3. What are the main issues facing agriculture in the region?
4. What will happen to Bay Area farmland if trends continue?
5. What farmlands should be kept, and how should that be done?
6. How should farmlands preservation relate to urban development in the Bay Area?

In mid-1980 a major report on the case for farmlands preservation based on the above information will be completed by POS and widely distributed throughout the region.



Regional Plan Open Space System

Adapted from ABAG Regional Plan 1970:1990

Open Space System

3.4 million acres permanent, plus 628,000 acres for after-1990 urbanization—only if population exceeds 7.2 million

Urban Areas to 1990

Based on 1970 projection of 7.2 million people by 1990; 1983 projections now estimate 6.1 million people by 2000.

Map prepared by People for Open Space
San Francisco, California
1983

Scale in Miles
0 5 10 20

North

People for Open Space

People for Open Space (POS), established in 1958, is the Bay Area's only conservation organization concerned with the open space and regional planning needs of the entire nine county region. For the past twenty years POS has worked to educate Bay Area residents concerning the importance of open space as a vitally necessary element in the region's metropolitan physical structure. POS helped in the development of ABAG's first open space proposals in the 1960's, and in efforts to implement them in the early 1970's.

Believing that stronger action by citizens was necessary to carry out the open space goal of the ABAG Regional Plan, POS in 1976 began developing a proposed Greenbelt Action Program. In 1979, the Farmlands Conservation Project was undertaken as a major first step in this effort to gain effective public understanding and support for action to establish a permanent greenbelt in the Bay region.

Farmland and the Metropolis

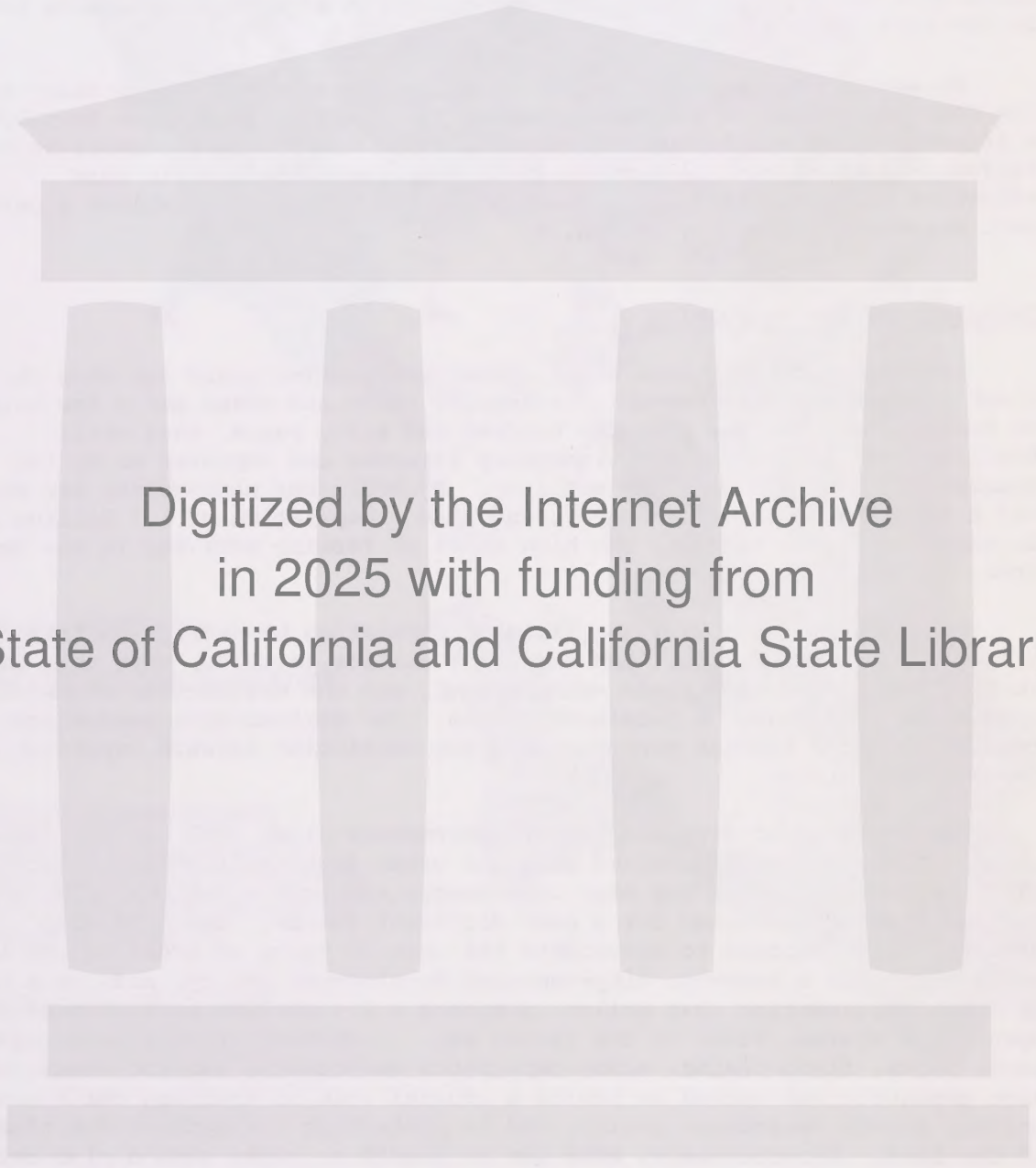
Farming in the Bay Area began almost two hundred years ago when the first mission settlers brought cuttings of vines and trees and a few animals to the region. For the next one hundred and sixty years, this small beginning was constantly and vigorously expanded and improved on by the Spanish and then the American settlers. By 1940, the nine-county Bay region had a large agricultural industry, and also a population of 1.7 million people. In many ways, this time was the high point of farming activity in the Bay Area.

But following the war, the region's population boomed, going from 1.7 to 3.6 million by 1960, and then to 5 million in 1978. With this increase in population came widespread urban sprawl, and the destruction of major portions of the region's farmlands system. The agricultural land which remains is under intense pressure from the continuing outward expansion of the region's cities.

The response of city and county governments since 1960 has not changed greatly the pattern of farmland loss and urban decentralization, although in 1970 the Association of Bay Area Governments approved a regional plan which for the first time called for a much different future. The 1970 ABAG Regional Plan proposed to accomodate the next 20 years of urban growth in accordance with a compact, city-centered development policy, and, as a key tool for implementing that policy, proposed a 3.4 million acre permanent open space system, shown on the facing map. Comprised of watersheds, farmland, parks, flood plains, urban separators and natural habitat areas, this huge greenbelt was viewed as having a crucial role in carrying out a metropolitan growth management policy, and in protecting the natural functions of the land. Unfortunately, ABAG has no powers to carry such a plan out, and the promise of the plan's bold proposals has remained unfulfilled nine years after the plan's approval.

Because of this inaction, open space in the region continues to be lost at a rate of almost 20,000 acres per year, most of it farmland. Because the benefits the region -- and the nation -- stand to lose from this current trend are great, it is important to understand the process and magnitude of farmland conversion more fully. That is the task of this report.

* * *



REPORT HIGHLIGHTS

CONCLUSIONS:

The Bay Area is not only a major metropolitan region, it is still a significant agricultural producer. But at a time when land is becoming a crucial factor in agriculture nationwide, the Bay Area is continuing to lose its farmland at a rate of 23,000 acres per year. Almost 75% of this loss occurs because of urbanization and its indirect effects.

This loss of farmland is significant to the Bay Area because of the many benefits which the region's residents, and its farmers, derive from agriculture. But equally and perhaps more important, the loss of farmland in the Bay Area is nationally significant. Cumulatively, direct urbanization in metropolitan regions like this one causes 1 million of the 3 million acres per year annual U.S. farmland loss -- a loss of *4 square miles per day* to the pressures of suburban development alone. Almost all of this loss is due to the isolated decisions of thousands of local governments. And for every acre lost to urbanization (or any other cause) in the Bay Area and other regions, new land must be brought into production to meet ever-growing demands for food and fiber. But with cropland reserves now far less than previously thought *and* with yields more unpredictable, this loss can no longer be passed off as insignificant, especially given the growing world-wide concern over food and energy resources.

Instead of slowing, however, indications are that the loss of farmland in the Bay Area has been increasing recently and that it will continue to accelerate in the future. Unless action is taken, agriculture may well be gone from the Bay Area in less than a century.

MAJOR FINDINGS:

1. *The loss of land is becoming critical for the nation's agriculture.*

The rising demand for food is now the most predictable element in agriculture today. Rising yields per acre can no longer be taken for granted. At a time when an adequate supply of land is needed more than ever for a margin of safety, estimates of cropland reserves have been cut by more than half in just 8 years.

2. *Farmland loss in the Bay Area is part of this problem.*

The Bay Area is not "too urban" to worry about its agricultural land. In proportion to its size, it still has as much land in crops as California as a whole; it has proportionately more land in farms. In 1978, it produced $620 million worth of agricultural commodities, 6% of California's total.

One-third of the U.S. cropland loss is due to direct urbanization, and it is occurring in places like the Bay Area. Cumulatively this loss is a significant share of the national farmland problem and cannot be ignored.

3. *Farmland conversion is much more than urban development alone.*

When taken as a whole, the loss of farmland due to urbanization and its effects may total as much as 75% of the total agricultural land loss in the Bay Area. Direct urbanization accounts for 30% of the total, while urban-related idling causes 10%. Urban-related open space takes approximately 10%, and the loss to parcelization and rural residences may add another 25%. The loss of farmland for agricultural reasons appears to be relatively small.

4. *Farmland loss in the Bay Area is accelerating.*

Farmland loss increased in the Bay Area between 1969 and 1974. Future projections indicate that this trend will continue and probably accelerate, until steps are taken to protect farmland, or until the region's agriculture is virtually eliminated.

Chapter One: WHY THE LOSS OF BAY AREA AGRICULTURAL LAND IS A PROBLEM

A. Local and Regional Benefits of Bay Area Agricultural Land

The agricultural land of the Bay Area is important to the region's residents for many reasons, because agricultural land performs a multitude of functions. Some of the benefits of the Bay Area's agriculture stem from the fact that it is a basic resource, on which an important economic activity depends, and which provides economic diversity and a renewable source of regional wealth. Agriculture is comparatively independent of factors affecting the other basic industries in the region. For example, curtailment of government defense spending affects aerospace and electronics manufacturers but leaves the agricultural sector unscathed. Agricultural industries help reduce the disruption of local and regional economies. The jobs that agriculture provides are numerically significant in many localities; the "spin-off" jobs in food processing, inspection, wholesaling and transportation benefit other localities within the region, including some of its most "urban" cities. Moreover, many of the jobs in agriculture and related enterprises require different skills than those needed by other industries. They provide important types of employment opportunities.

In addition, agricultural production within the region means that Bay Area residents can enjoy fresher fruits and vegetables at more reasonable prices than would otherwise be available. Specialty crops grown in the region because of rare combinations of soils and microclimate increase the variety of foods available throughout the country.

Aside from its economic benefits, other benefits of the Bay Area's agricultural land stem from the fact that it is an extensive user of open space. Over half the region's land is in farms. Completely incidental to its agricultural productivity, this land provides most of the benefits of open space. These include air quality protection, ground water recharge, and buffers for environmentally sensitive areas. In addition, agricultural land can protect soil resources, provide opportunities for sewage disposal, and maintain certain wildlife habitats. Not least, agricultural land helps define and separate urban communities. Healthy agriculture can help reduce urban sprawl.

Some of the benefits of the Bay Area's agricultural land arise because it is uniquely both the basis of an economic activity and an open space resource. The use of land for agriculture provides a tangible link with the traditions of the past and the natural environment of today. Buying fresh food grown in the region, and buying it on the farm during a Sunday drive, is possible because agriculture is an economically productive open space land use. In the wine-producing counties of the region, tourism is a significant source of local wealth that "spills over" from the agricultural sector; it depends in part on the scenic beauty of the vineyards -- not just on the grapes they produce.

Agriculture can also provide an economic use of land that should not be urbanized. Such lands may be in flood plains, or have unstable soils and steep slopes. They may be too remote to provide with adequate public services. Airport landing zones are other areas where agriculture may be a more appropriate use of land than houses or other urban development. Retaining agriculture in areas like this reduces public service costs and keeps the land on local tax rolls. Agriculture is a fiscally sound alternative to unwise or

inefficient urban development.

Most of these functions are primarily local and regional in nature. Their benefits accrue directly to the people of the Bay Area, and many of them are irreplaceable. Food can be imported to the region from other areas, but none of the economic and open space benefits provided by the Bay Area's agricultural land can be imported with it. The loss of Bay Area agricultural land is a problem from the local and regional perspective because it gradually diminishes both the economic and open space benefits such land provides. These benefits and the nature of the region's agricultural resources are described in greater detail in two other POS Background Reports: Farmland and Farming in the Bay Area; and The Functions of Bay Area Farmland.

B. The Costs of Replacing Bay Area Agricultural Land

The production lost from agricultural land urbanized in the Bay Area must generally be replaced by increased production elsewhere. Whether this occurs within the United States through upgrading existing agricultural land, or whether agricultural imports are increased, the replacement of Bay Area agricultural land entails many costs -- economic, environmental and social.

Some of the costs of replacing Bay Area agriculture are direct and borne primarily by the region's residents. Greater dependence by the region on long-distance transportation of agricultural commodities at a time of rising fuel prices will be reflected in higher prices for food. Substituting more distant production and greater long-haul transportation for some local self-sufficiency may be economically attractive at a particular point in time. But the transfer of agricultural land to urban uses is a uniquely one-way street. Once the agricultural land is gone, there is no reasonably feasible way to shift back to local production if fuel prices suddenly rise. Alternatives such as direct marketing by farmers to consumers are also less viable if food production is distant from urban centers. Once an area's local agricultural resources are permanently committed to other uses, there are few options but to pay higher fuel costs passed through in the price of food.

In most cases, however, the costs of replacing agricultural land lost from the Bay Area are indirect and widespread. As part of a cumulative pattern, they are felt nationwide. If agricultural land were being lost only in the Bay Area, there would be relatively few costs to replacing it elsewhere. But the fact is that agricultural land is being taken out of production by urban pressures all across the country. No single city or region perceives itself as a significant contributor to the problem, but by their independent actions, each helps ensure that productive land around cities will have to be replaced. The costs of bringing marginal replacement land into production--and keeping it in production -- are reflected in taxes for public imporvements, erosion control, and agricultural disaster relief, as well as in food prices. The costs of relocating or duplicating the transportation facilities, and related industries and development needed by agriculture, will also be felt by consumers and taxpayers generally. The environmental damage caused by fertilizers, pesticides and herbicides -- and even irrigation -- needed to keep marginal lands productive are now being recognized.

The Bay Area's mild climate is an agricultural resource that is rare in the United States. Although many of the commodities produced in the region (and

in California generally) are specialty crops, the demand for them is no less real. If the particular climates these crops require are pre-empted for urban development, the commodities will be grown at higher costs under artificial conditions, or imported. Heavier agricultural imports will have gradual but definite impacts on the United States balance of payments, and consequently on domestic inflation, that will be felt throughout the economy over the long-term, and which the country can ill afford. Non-economic costs may also show up in the long term. For example, there may well be health damage from importing on food pesticides and herbicides illegal in the United States but impossible to control in other countries.

Loss of agricultural land in the Bay Area is a significant problem not only because of the loss of local and regional benefits such land provides, but because Bay Area agricultural land loss is part of a larger pattern that cumulatively has many direct and indirect costs felt far beyond the region. Far more significant than the costs of replacing productive agricultural land lost to urbanization, is the fact that, for the first time, the ability of the United States to continue making such substitutions at all is in serious question. This situation, and the role the Bay Area plays in it, are the subject of the following chapters.

Chapter Two: THE UNITED STATES FARMLAND BASE — WHY WORRY?

A. Recent Trends: More from Less

While it is true that "they ain't making land anymore," it has been possible in the recent past to "make" land agricultural and intensify its use -- seemingly without limit. In the years since World War II a number of factors happily coincided to increase yields per acre of staple food crops dramatically. In the United States alone, farm output increased between 1950 and 1970 by an unprecedented 40%.[1] Farm productivity slightly outpaced the nation's population increase of 34% during the period, even as the total amount of land in crops declined by 25 million acres (6%) between 1950 and 1969.[2] In short, the United States had more surplus food production capacity in 1970 than it had in 1950, despite population increase and a reduction of the farmland base equivalent to three times California's irrigated acreage.

Obviously if yield increases continue to outpace population growth, there is little need to worry about the loss of relatively small amounts of farmland on a national scale.

There are three basic factors, then, that determine whether the loss of farmland, particularly the practically irreversible losses to urban development, should be a matter of concern. They are: yields per acre; the demand for food; and the potential for bringing more farmland into production.

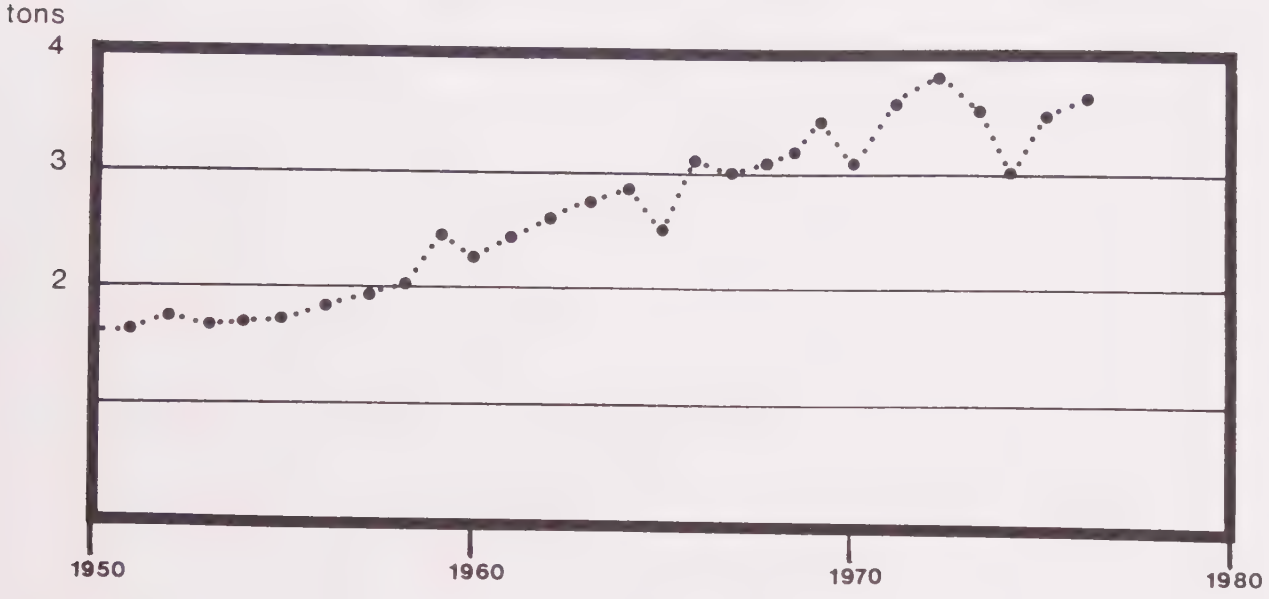
B. Yields per Acre: End of the Green Revolution?

Increasing yields per acre occurred reasonably predictably during the 1950's and '60's. It is easy to forget that this "trend" is actually a very recent phenomenon. For many decades prior to World War II yields increased very little. As Lester Brown of World Watch Institute writes: "Corn yields in the United States during the 1930's were the same as those during the 1860's, the first decade for which reliable yield estimates are available."[3]

Yet there are signs that the dramatic and steady increases of the 1950's and '60's may be levelling off and becoming more erratic world-wide. Lester Brown describes the global situation:

> From 1950 to 1971, the cereal yield per hectare climbed . . . 2.4 percent per year. Between 1971 and 1977, the yield increased at only one-fourth that rate, or 0.6 percent per year.
>
> Within the United States, the yield turned abruptly downward in 1973. While the yield of all cereals combined increased by a rather spectacular 4.0 percent per year from 1950 to 1972, it has actually declined since then. The 1977 yield was 6% below that in 1972. Per hectare yields of wheat, barley, oats, rye and rice peaked in 1971; the yield of corn peaked in 1972. As of 1977, none of these cereal yields had regained its earlier high level.[4]

FIG. 1: U.S. CEREAL YIELDS PER HECTARE 1950-77



Source: L. Brown (1978)

Although yields per acre have now recovered since 1977, their continued rise can no longer be taken for granted. Norman Berg, of the U.S. Department of Agriculture, says of the long-term trend:

> In recent years, yields per acre have continued to increase, but at a decreasing rate, suggesting that available agricultural technology may have reached the point of diminishing returns . . . Evidence indicates that we have reached the point where decreases in land in production may no longer be balanced by increases in productivity.[5]

Others involved in projecting the future of agriculture agree that the long-term yield increases projected from past trends have generally been overestimated. The California Department of Water Resources uses estimates of future yields to plan for irrigation needs. Between 1968 and 1974 the Department, on the advice of leading agricultural experts, revised its estimated yields of 45 California crops. It graphed the revisions for eight crops, which were "selected as being fairly representative of the trend of all crops. They account for 30 percent of the total state irrigated acreage . . . "[6] The estimated yield comparisons are reproduced in Figure 2. Projected increases in yields per acre are down for all crops except oranges compared to what the Department projected in 1968.

When the factors that contributed to yield increases in the past are considered, it is not surprising that analysts since 1972 have begun to make more conservative estimates. Energy, especially, has become a critical factor, since most United States agriculture is highly energy-intensive. Petroleum products are used in farm machinery, irrigation pumps, and for heating animal shelters, greenhouses and so on. They are also used to transport agricultural produce, and most chemical fertilizers are derived from natural gas. Uncertain supplies and certain price rises could seriously affect long-term productivity trends. Melvin Cotner of the USDA writes,

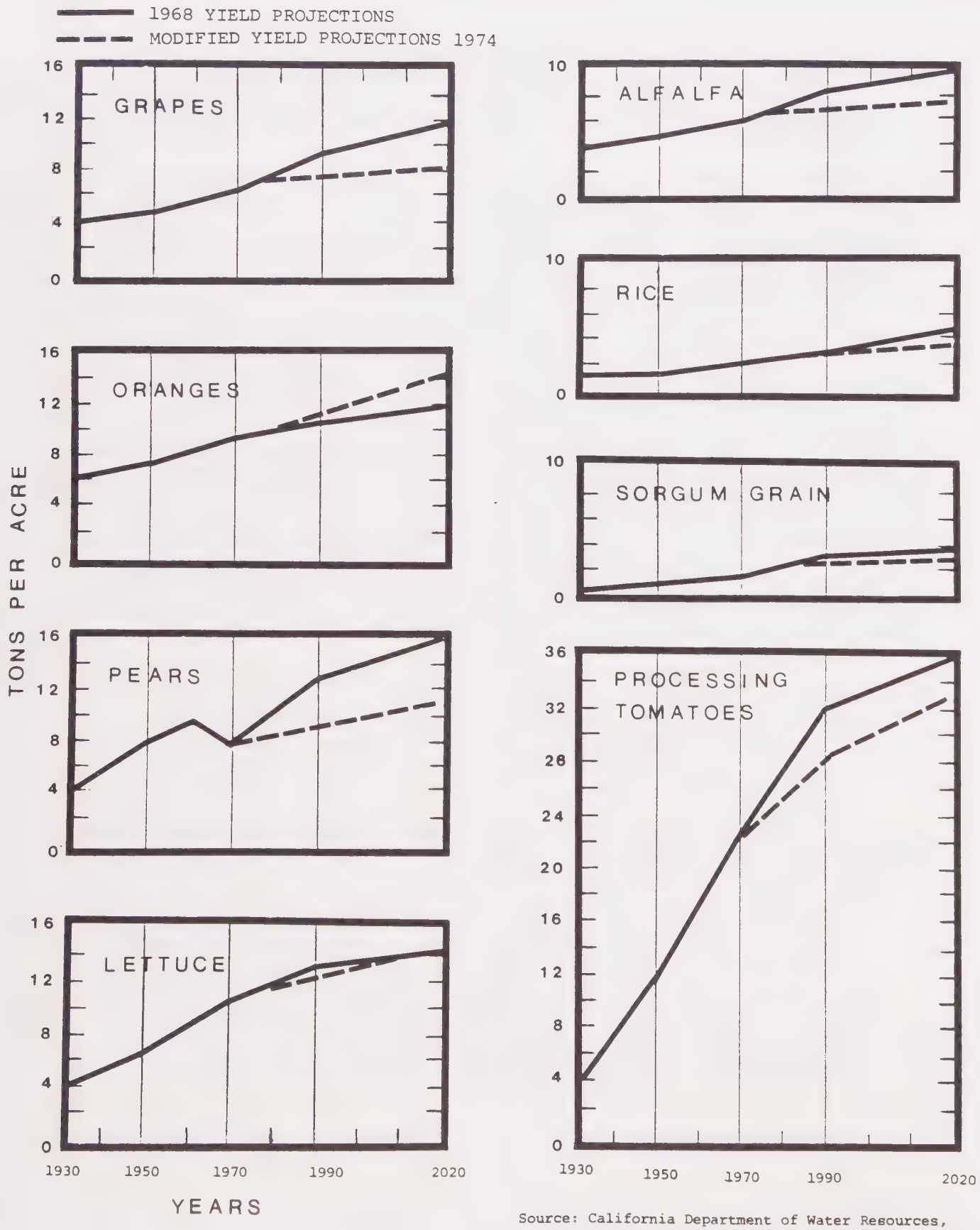
> . . . potentially important future constraints on production include: energy costs, water availability, increasing costs of non-land inputs, environmental restrictions, a declining rate of advancement on agricultural technology, continued conversion of productive farmland to nonagricultural uses, and volatile export demands.[7]

Although it seems obvious that revolutionary increases in productivity cannot be sustained indefinitely, a USDA study of metropolitan agriculture as recently as 1974 assumed that they would:

> In the early 1950's, almost 2 acres of cropland were used per capita to supply domestic needs. By the 1970's this had dropped to less than 1¼ acres per capita. *As long as such gains in agricultural productivity continue,* land needed for living, working, and recreation for an increasing population, even at higher per capita rates of use, can probably be provided with a minimum total impact on United States agricultural production and consumption.[8] (Emphasis added).

FIG. 2

AVERAGE YIELDS OF SELECTED FARM CROPS IN CALIFORNIA



Source: California Department of Water Resources, "The California Water Plan-Outlook in 1974." Bulletin 160-74. (1974)

Yet productivity increases characteristic of the 1950's and 1960's had already begun to taper off by 1974 and there is little reason, barring some unforeseen breakthrough, to expect them to be regained in the near future -- much less be maintained indefinitely.

The USDA conclusion quoted above referred only to the United States. The market for United States agricultural produce is world-wide, however. The quantity of United States exports increased 77% between 1964 and 1977.[9] Foreign demand is no longer a minor influence on long-term need for agricultural land in the United States.

C. The Demand for Food: Going Up

World-wide population seems certain to outstrip land planted to staple crops. The Worldwatch Institute has projected population trends and land in cereal crops to the year 2000 (See Table 1). They estimate that the area planted to cereal crops will grow by 43% between 1975 and 2000. Population is expected to grow even faster, however -- by 58% during the same period -- meaning that the amount of land in cereals *per capita* will shrink. In order to maintain the same cereal production *per capita*, yields will have to continue to increase and will have to begin to increase at a faster rate than the world needed during the last 25 years.

Table 1

World Population and Area in Cereals, 1950 and 1975, with Projections to 2000

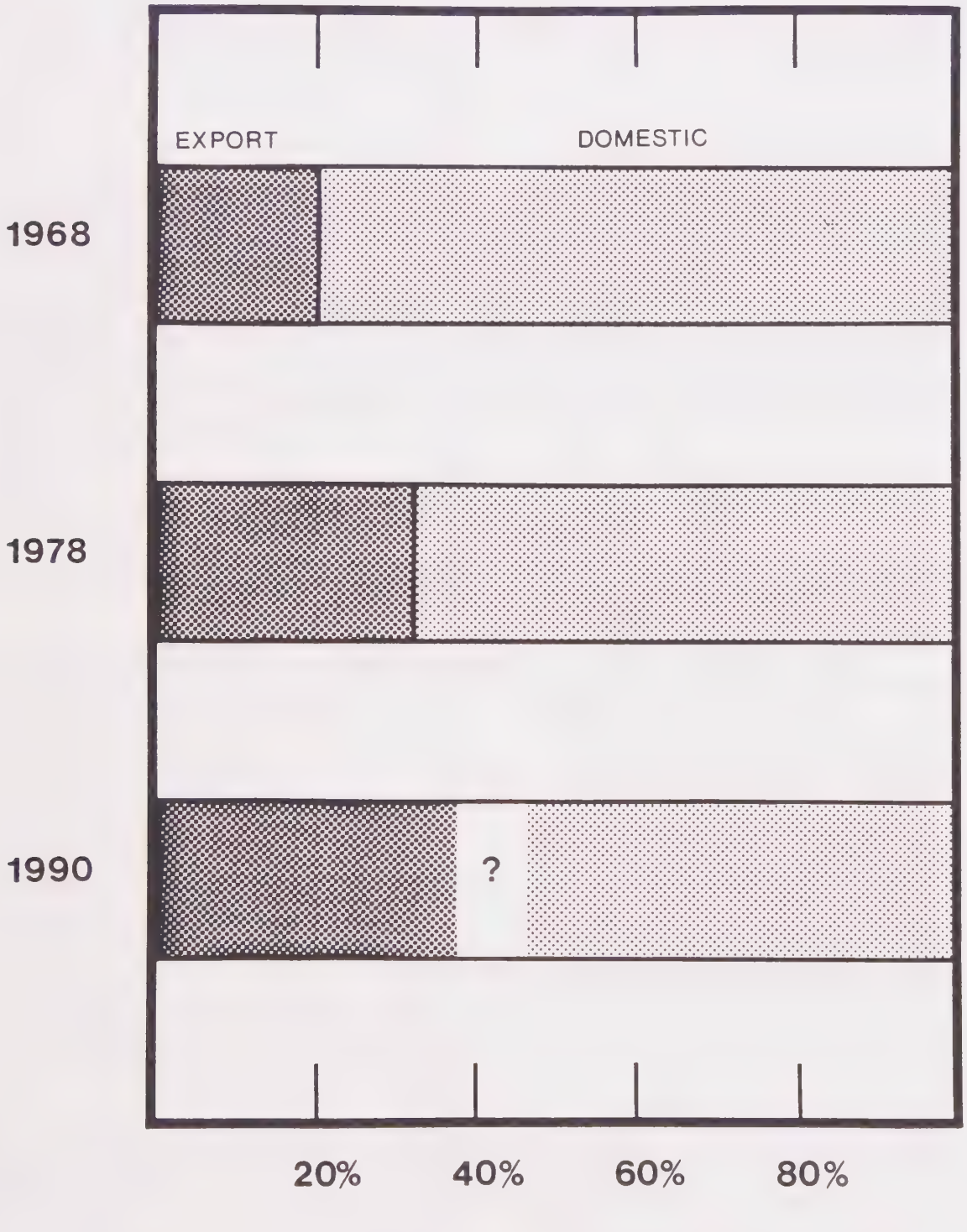
Year	Pop. (billions)	Percent Change	Area in Cereals (million hectares)	Percent Change	Area Per Person (hectares)	Yield Increase Required to Maintain Same Amount of Cereals per Capita
1950	2.50	-	602	-	.241	-
		58.8		21.4		31.0%
1975	3.97	-	731	-	.184	-
		58.4		9.9		43.7%
2000	6.29	-	804	-	.128	-

Source: Lester R. Brown, The Worldwide Loss of Cropland, Worldwatch Paper 24, October 1978. p. 36, Table 2

There are already many hungry people in the world, however, who are unable to make their food needs felt in the marketplace because they are too poor. More hunger does not necessarily mean that there will be more *effective* demand for U.S. agricultural exports. World hunger may eventually make itself

FIG. 3

EXPORT DEMAND FOR U.S. CROPLAND



Source: American Land Forum (1979)

felt in the marketplace, but the increasing prosperity of other countries compared to the United States has already increased demand for American farm products. As one analyst pointed out:

> The demand for food from the United States that caused a big jump in grain prices and a disastrous jump in farmland prices was not the result of hunger, nor is it likely to be the result of hunger in the future. Countries in the middle range of economic development . . . have come into the market not for food for their hungry, but for the grain to produce the meat supply of their newly affluent working class.[10]

Whether the United States can stand by while world hunger worsens -- with the large-scale misery and political instability that accompanies it -- is a question that must be faced in coming decades. But in the meantime, export demand for United States commodities is already claiming a larger share of total United States production. A report by the American Land Forum points out:

> A decade ago, United States farmers exported the product of about one out of every five acres harvested. Today, the product from about one out of every three acres harvested is exported. Export demand for United States food has escalated so quickly that a United States Department of Agriculture projection of cropland needs based on a continuation of post 1972 trends estimated that 407 million acres of *harvested* cropland would be needed by 1985 to meet projected export demand -- an 81 million acre increase over harvested cropland in 1974.[11]

While it is unlikely that Americans will go hungry as a result of foreign competition for food, massive Russian grain purchases in 1972 shattered the illusion that American consumers would be spared the price impacts of growing export demands. With agricultural products contributing one-fifth the value of total United States exports, even the alternative of curtailing foreign sales would entail significant costs, due to higher balance of payments deficits and resulting domestic inflation.[12] The United States is likely to be affected directly as the people of the world prosper -- or starve.

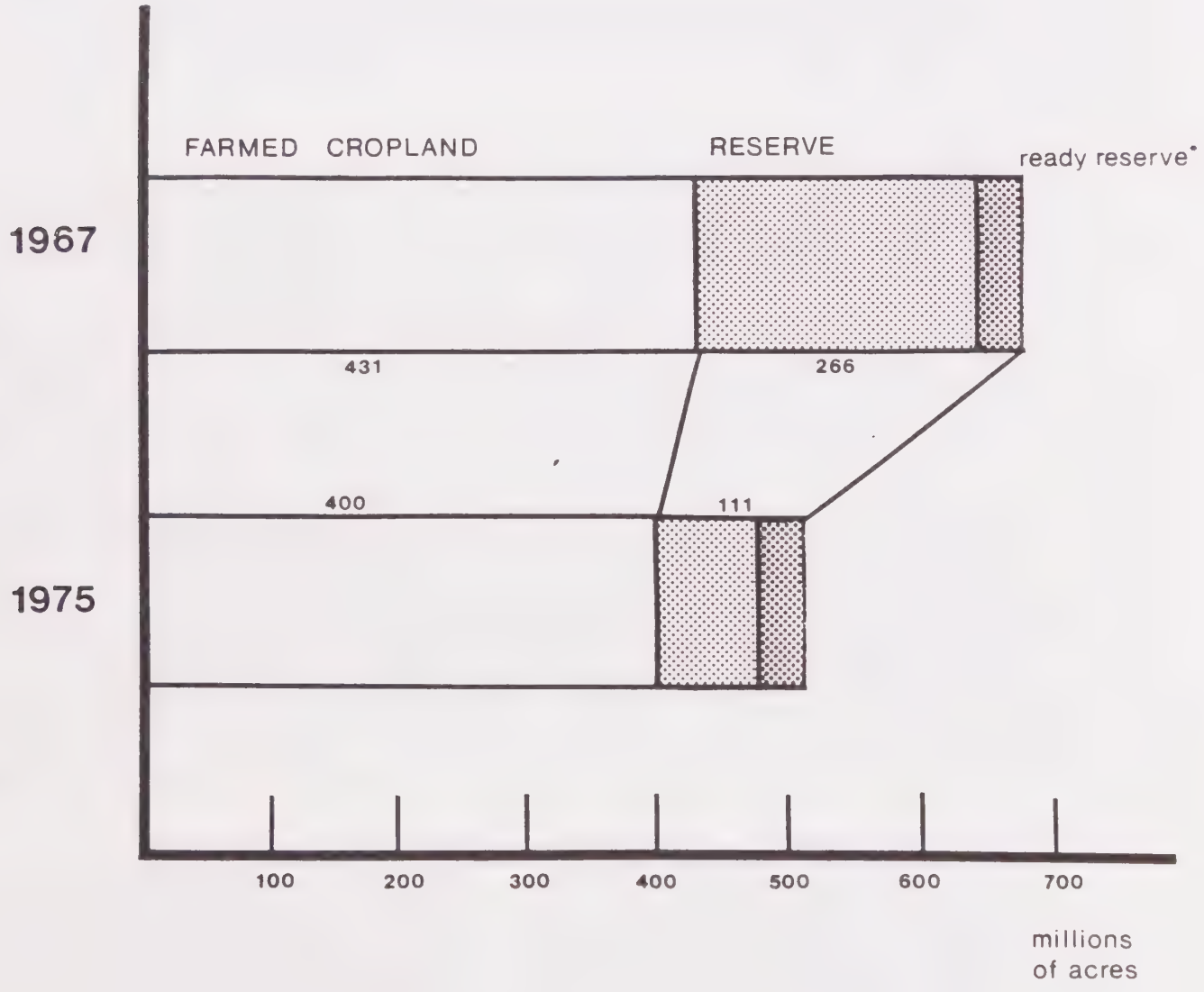
D. Cropland Reserves: How Much Land in the Bank?

One of the first impacts of growing food demand -- and concomitantly rising prices -- was to bring more United States farmland into production starting in 1972. By 1978, in part because of good weather elsewhere in the world, surpluses had again developed and limited federal set aside programs were re-introduced. Although the land deficit proved to be temporary in this case -- and relatively easy to rectify -- the need to "call up the reserves" raised for the first time in a number of years the question: how big are the reserves? How much agricultural land does the United States have on hand to meet the demands of the "one year in a hundred" when things go wrong and crops fail on a massive scale world-wide?

The Soil Conservation Service of the USDA undertook a study of this question, and their findings gave little cause for complacency.[13] Cropland had fallen from a total for the United States of 431 million acres to 400 million acres between 1967 and 1975. Yet estimates of land that had "high or medium potential" for being brought into production had also declined. In 1967 the reserve was estimated at 266 million acres. In 1975, the SCS estimated it at 111 million acres, of which only 35 million acres could be brought into

FIG 4

CHANGES IN U.S. CROPLAND ESTIMATES



*Land immediately available for cultivation -- approx. 35 million acres in 1975

Source: SCS Potential Cropland Study (1977)

production simply by beginning tillage.[14]

Of course 35 million acres is still a lot of land. It is about twice as much as was converted to urban uses between 1967 and 1975. But it is less than 9% of the United States cropland base. Because the least productive land tends to be idled first, the cropland reserve would almost certainly produce less than a 9% increase in farm output if put into production on an emergency basis. And that is a lot closer to the limit of the reserve than we were as recently as 1967, when we thought we had more than twice as much land to spare.

One researcher has estimated how much of its 1975 cropland reserve the United States is likely to need by the year 2000.[15] Only under the "optimistic projection" (low demand, high productivity increases per acre) would the United States have more land in reserve in 2000 than it has now. Under the "pessimistic projection" (high demand, low productivity) the United States would actually use up all the reserve (111 million acres) and even run short of land. (See Table 2 on next page).

Although both the "pessimistic projection" and the "optimistic projection" are probably unrealistic (as far as one can guess conditions in 2000) either of the middle-range projections is alarming. If even 65% of the 1975 reserve were in use by the year 2000, and no further land were abandoned or converted from agriculture to other uses, the United States would have only 8½% of its cropland base -- including land of low conversion potential -- left in reserve. Although even in that case no Americans would necessarily starve, there would certainly be price increases that would severely impact some people; increased governmental assistance would be necessary for some people to compensate for higher food costs.

E. Forecast: Uncertainty

Even the middle-range projections in Table 2 could be overly pessimistic, of course. We might be well within the margin of safety predicted by the optimistic projection in 2000. There is after all, a vast difference between the projected land needs. Indeed, perhaps what these numbers illustrate best is not *how much land we will need in 2000*, but *how much difference small changes in assumptions behind projections can make after 25 years*. The fact that, under assumptions which are believed to be plausible, we are even contemplating the day when the United States land supply could constrain the world food supply is new. At a time when continued uncertainty seems the most reliable prediction about resources, we need an adequate safety margin more than ever.

Concerns over United States agricultural land may seem alarmist or exaggerated now, but who took projected energy shortages seriously before 1973? The stakes in food are even higher than those in energy. If we are complacent about the world's agricultural future, it is interesting to note that some of the nations that depend on food imports are not. A British government "white paper" concluded in 1975 that a policy of expanding domestic food production in the United Kingdom was justified, given the increased competition

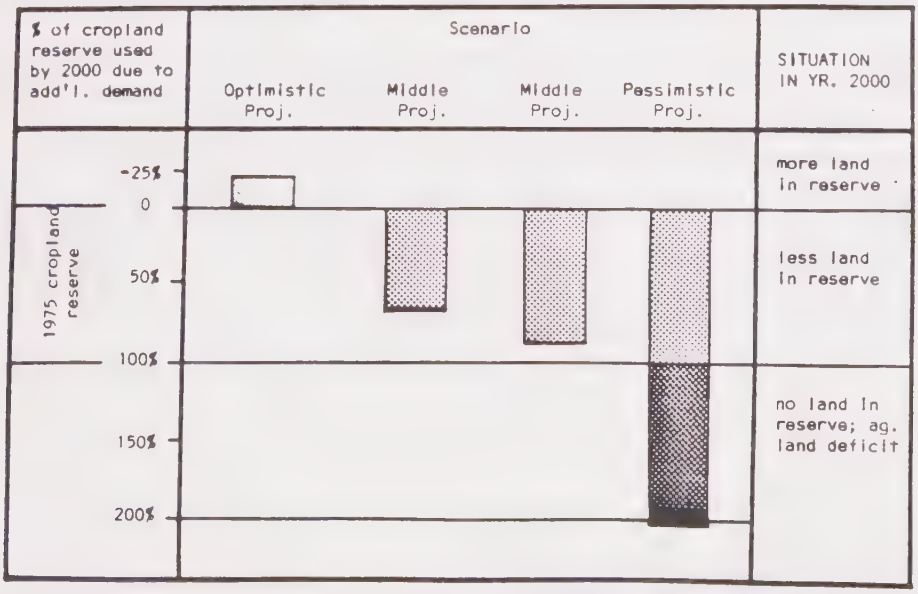
Table 2

ALTERNATIVE SCENARIOS OF AGRICULTURAL OUTPUT AND THE DEMAND FOR AND AVAILABILITY OF CROPLAND IN THE YEAR 2000

Scenario	Projections for the Year 2000			
	Agricultural Output (1967 = 100)	Demanded Cropland (million acres)	Additional Demand for Cropland* (million acres)	Additional Cropland Demand as a Percent of the 1975 Reserve**
timistic Projection w Demand (up 1.4% year) Productivity ply up 1.2% per year)	141	360	-25	-23%
Middle-Range Projection Low Demand (up 1.4% per year) Low Productivity (Supply up 0.0% per year)	133	457	72	65
Middle Range Projection High Demand (up 2.3% per year) High Productivity (Supply up 1.2% per year)	189	482	97	87
Pessimistic Projection High Demand (up 2.3% per year) Low Productivity (Supply up 0% per year)	178	611	226	204

* The demanded cropland in the year 2000 minus the 1975 cropland base (385 million acres)
** The additional cropland demanded in the year 2000 as a percent of the 1975 cropland reserve (111 million acres).

From Plaut, p. 34, Table 5.



and rising prices expected in the world food market.[16] Another British study concluded:

> The assumption that the UK can continue indefinitely to rely on substantial food and timber imports for supplies which cannot be produced indigenously clearly requires scrutiny . . . There is considerable concern that even if supplies are available in physical terms, the relative cost of imported food and timber to the UK will increase because of increased competition for the available supplies.[17]

The United States is "land rich" compared to Britain, but it is part of the same world. Although the people of the United States will almost certainly never be short of food due to inadequate domestic supplies, they have already been affected by the rising food prices caused by scarcity elsewhere. *At the very least,* the United States should be taking questions about the adequacy of its agricultural resources seriously. We should be using those resources prudently now to ensure ourselves the option to adapt to <u>whatever</u> conditions occur in the future.

NOTES

[1] Krause, Orville and Dwight Hair, "Trends in Land Use and Competition for Land to Produce Food and Fiber." In Pespective on Prime Lands, U.S.D.A. 1975, p. 12. Table 10.

[2] Ibid. and p. 2. Table 1.

[3] Lester R. Brown, "The Worldwide Loss of Cropland," Worldwatch Paper 24, October 1978. p. 26.

[4] Ibid., p. 27.

[5] American Land Forum, Report No. 1. "Land and Food: The Preservation of United States Farmland." Spring 1979. p. 19.

[6] California Department of Water Resources, "The California Water Plan -- Outlook in 1974." Bulletin 160-74. 1974, p. 52 - 54.

[7] Melvin L. Cotner, Director, Natural Resource Economics Division. Economic Research Service, U.S.D.A., "Land Use Policy and Agriculture." ERS - 630.

[8] Economic Research Service, U.S.D.A. "Farming in the City's Shadow." Agricultural Economics Report No. 250. 1974. p. 13.

[9] U.S.D.A Agricultural Statistics 1978, U.S.G.P.O., Washington D.C. 1978, p. 563.

[10] Raup, Phillip M. quoted in American Land Forum, "Land and Food . . . " p. 20.

[11] American Land Forum, p. 26.

[12] U.S.D.A., op cit. P. 563.

[13] Diderikson, Raymond I. et al, "Potential Cropland Study." U.S.D.A. Soil Conservation Service Statistical Bulletin No. 578. October 1977.

[14] Part of the change in estimates between 1967 and 1975 is due to a more realistic definition of "potential" cropland used in 1975, rather than to actual land use changes. One study argues, however, that the 1975 estimates of potential cropland are probably still too high. (U.S. General Accounting Office, "Preserving America's Farmland -- A Goal the Federal Government Should Support," CED-79-109, Washington, D.C. 1979. pp. 57-64).

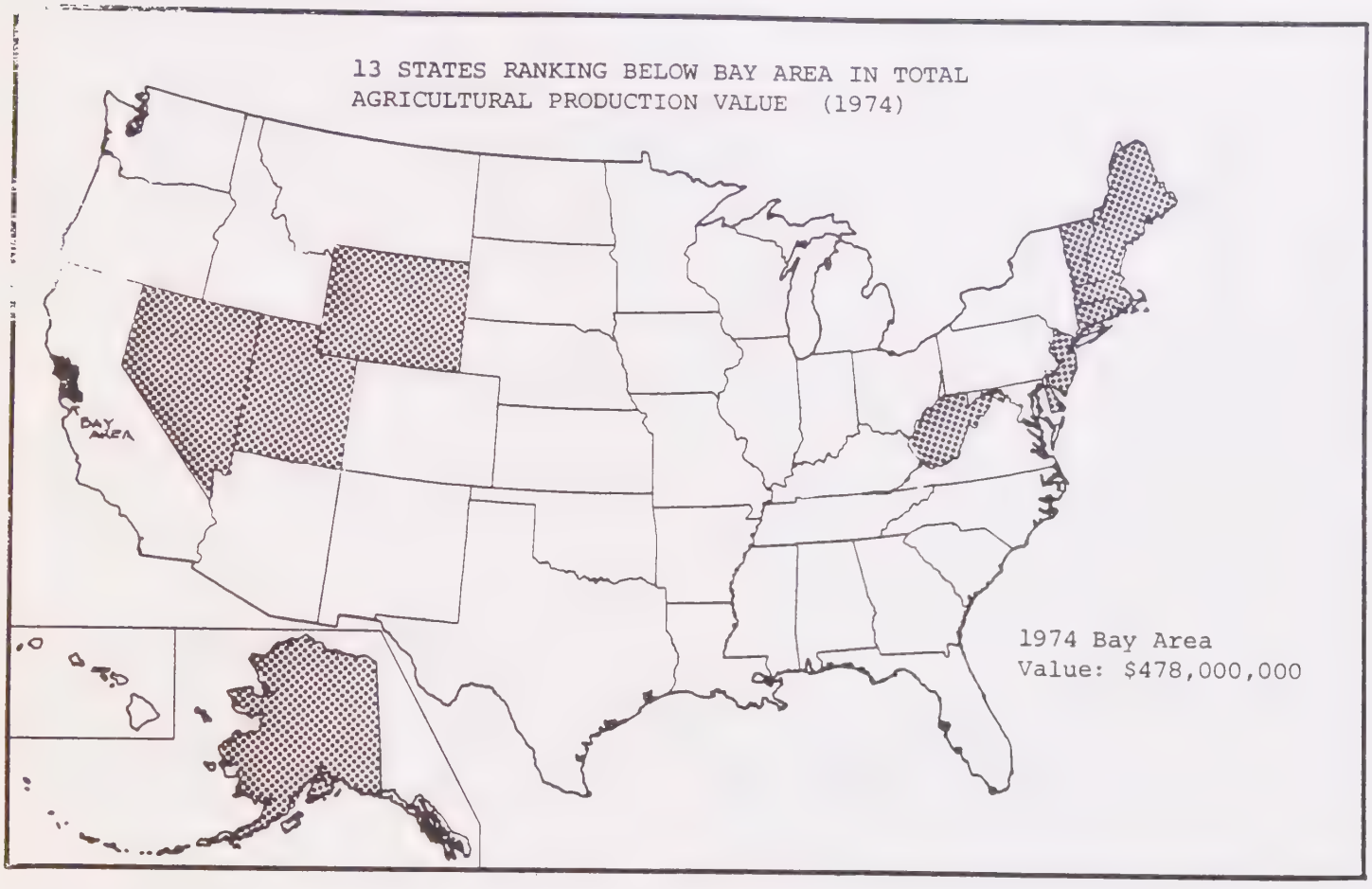
[15] Plaut, Thomas R. "Urban Growth and Agricultural Decline: Problems and Policies." unpublished paper, Bureau of Business Research, University of Texas at Austin. 1978. p. 29 - 35.

[16] White Paper, "Food from our Own Resources." Cmnd 6020. 1975. Quoted in Countryside Review Committee, "Food Production in the Countryside." London, H.M.S.O. April 1978.

[17] Centre for Agricultural Strategy, Land for Agriculture, University of Reading, October 1978. p. 16.

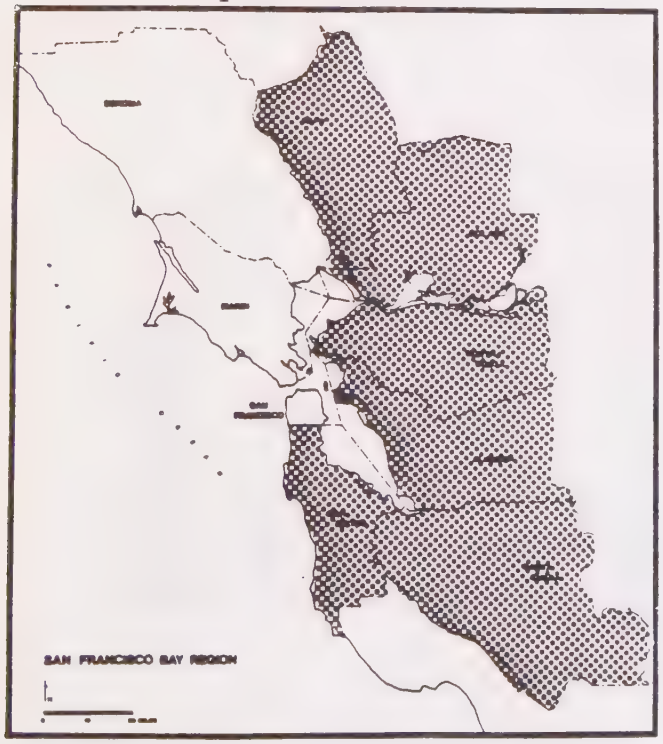
Chapter Three: THE BAY AREA'S FARMLAND LOSS IN PERSPECTIVE

FIG. 5

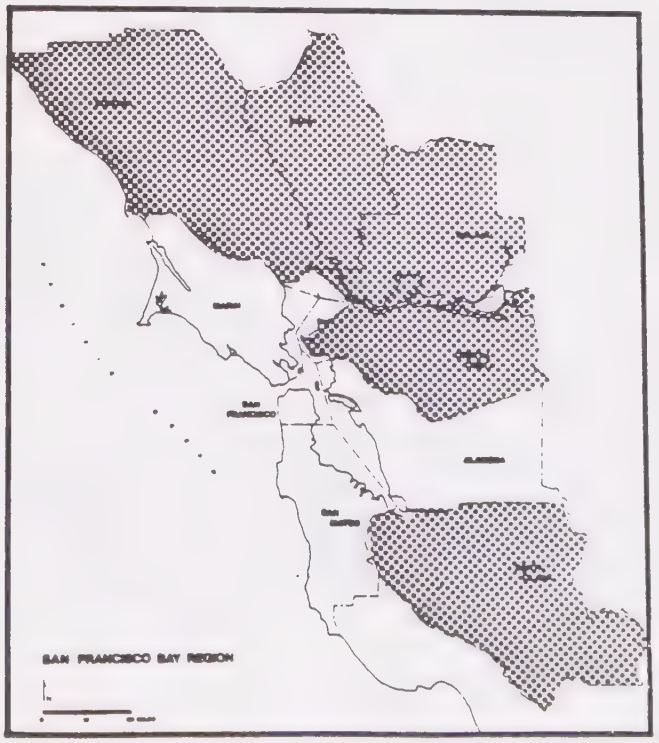


BAY AREA COUNTIES IN TOP 100 U. S. COUNTIES, 1974

By Value of Crops Sold per Acre of Cropland Harvested



By Value of Fruits, Nuts & Berries Sold



Source: US Census of Agriculture, 1974

What do growing questions about the long-term adequacy of the supply of agricultural resources in the United States have to do with the Bay Area? Farmland loss in the Bay Region *is part of the national problem.* In some ways it is a small part, but U.S. agricultural activity is so diverse and extensive that no single area's production is critical to the whole. No single area represents a large part of the problem of agricultural land loss; but cumulatively, thousands of seemingly small losses of farmland are the problem. And it is the Bay Area, among other places, where this farmland loss is occurring.

A. The Significance of Bay Area Agriculture

Although most people think of the Bay Area as urban, the region still has a great deal of agricultural activity within its nine counties. For example:

- If the Bay Region is taken as a whole, its land area is larger than four states; but it outranked thirteen states in terms of agricultural value produced in 1974.[1]

- On the basis of value of agricultural product per acre of land in farms, the region would have ranked tenth among the states in 1974.[2]

- In 1978 California led the nation in 48 agricultural commodities by volume produced. Bay Area counties were among the top five California producers for eight of those crops (apricots, artichokes, Brussels sprouts, cauliflower, flowers and foliage, pears, prunes, and processing tomatoes).[3]

- Individually, six of the nine Bay Area counties were among the top 100 counties in the nation in terms of value of crops sold per acre of cropland harvested in 1974.[4]

- Several Bay Area counties were among the leaders in particular types of crops by value.[5]

- The total value of the Region's agricultural production in 1978 was $620,692,700 -- about 6% of the state's total from 4% of its land area.[6]

Because they are in the same state, Bay Area counties are frequently compared -- unfavorably -- with the counties of the Central Valley in terms of agricultural productivity and output. Yet the Central Valley is impressive precisely because it is such an unusually productive agricultural area. A few California counties lead not only the state's agriculture, but the nation's (and the world's) as well. In 1974, eight of the top ten counties nationally, in terms of value of products sold, were from California.[7] Bay Area counties do not outproduce the Central Valley counties, but neither do any other counties in the United States. Compared to the nation as a whole, the Bay Area's agriculture is not insignificant. If the region were to cease agricultural production entirely, the loss in dollar value in 1978 would have been greater than if Imperial County in Southern California, an acknowledged agricultural leader, had gone out of production.[8]

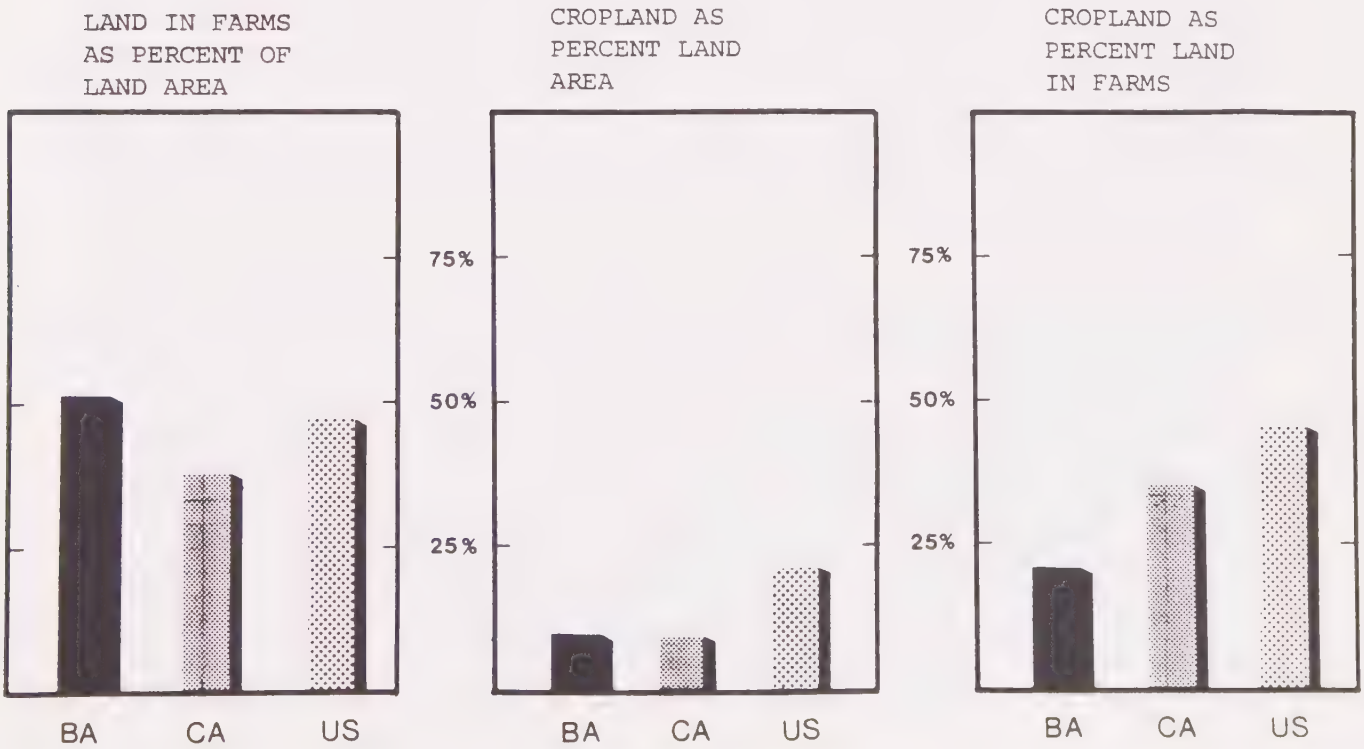
FIG. 6

AGRICULTURAL LAND USE 1974

Table 3

	Bay Region	California	United States
Land in farms (million acres)	2.3	33.4	1,017.0
% change 1969 - 74 Land in farms	-9.9%	-5.5%	-4.3%
Land in farms as % of land area	52.0%	33.4%	44.9%
Cropland as % of land area	10.2%	10.6%	19.4%
Cropland as % of land in farms	19.6%	31.8%	43.3%

Source: U.S. Bureau of the Census, Census of Agriculture, 1974.



B. The Bay Area: How Typical?

Just as it is easy to underestimate the importance of Bay Area agriculture, it is easy to overestimate the extent of agricultural activity in the rest of the country. In terms of area, productive regions like the midwestern Cornbelt are offset by vast areas of mountains, deserts, forests, government-owned land, and lands with various limitations, especially in the Western States and Alaska.

Table 3 compares agricultural land use in the Bay Region with California and the United States as a whole. Surprisingly, the Bay Area actually has a higher proportion of its total land area in farms than does either the State or the country. A smaller proportion of this farmland is devoted to crops in the Bay Area than either the state or the nation. But as a proportion of total land area, the Bay Region has about as much land in crops as California as a whole.

Of course the quantity of land in farms is not directly related to the quality of farmland. But here too, the Bay Area rates highly. In the Region about 17.5% of the land is in the two highest Soil Conservation Service Capability Classes for agriculture. Although a third of this land had been urbanized by 1966, the Bay Area still has a high proportion of top quality farmland compared to the statewide average. In California as a whole only 7% of the land is in Capability Class I and II. [9]

Furthermore, the Bay Area's climate is an agricultural resource that is rare in the United States, and even in California. The climate is mild all year round, which enables the Bay Area to produce crops at times of the year that are "out of season" in other parts of the country. Relatively scarce winter grazing is also available in the region. And the region is one of the few areas with microclimates ideally suited to particular crops. The fogbelt and its contribution to coastal crops like artichokes and Brussels sprouts, and to fine wine grapes, cannot be duplicated very many places elsewhere. Although none of these are basic food crops, they do contribute to the variety and quality of agricultural produce we enjoy. If they were not produced in the Bay Area, they would be imported, or they would be produced at higher costs elsewhere (and perhaps at the expense of land now in basic food production), or they might become food luxuries that many people would rarely taste.

The Bay Region, while urban, is in some respects no less agricultural than the State or the Nation. In certain respects it has rare or superior agricultural resources.

The diversity and productivity of the Bay Region's agriculture may be unusual for a major metropolitan area, but the fact that the Region is both urban and agricultural is fairly typical. A 1974 USDA study of metropolitan agriculture reported that about 14% of harvested United States cropland is within urban areas (Standard Metropolitan Statistical Areas or SMSA's). In 1969 the share of agricultural production (by value) from SMSA's was 21.5%; in the Pacific States it was 55.8% due to irrigation and relatively large counties. The study found that for eight major United States crops (corn, hay, soybeans, fruits and nuts, wheat, vegetables, tobacco and cotton) the

SMSA's share of output was greater than their share of cropland for all except wheat and tobacco. The report noted:

> . . . vegetable production, especially, was concentrated near population centers. About 60 percent of all vegetables sold in 1969 came from SMSA's, as did 43% of fruits and nuts.[10]

Perishable crops tend to locate near urban markets and this, together with the higher than average agricultural capability of land where cities tend to become established, is largely reponsible for the high value agriculture of metropolitan regions. There are other factors at work in these statistics, too, however. Some cities that started as agricultural service centers are now "metropolitan" in their own right.[11] And some of them are growing fast. Fresno County, for example, had a population of over 400,000 in 1970 -- more than four Bay Area counties. Moreover, Fresno County's population grew by 15.6% between 1970 and 1978, compared to the Statewide population increase of 11.6% during that period. Tulare County grew even faster, with a 19.3% increase over a 1970 population of 188,000.[12]

C. Urbanization of Agricultural Land: One-Third of National Farmland Loss

As metropolitan areas continue to expand, and agricultural service cities become metropolitan themselves, the proportion of farmland under urban development pressure will increase. Of course, urban development is not the only type of activity taking land out of production. Water storage projects covered an estimated 7 million acres of land in the United States between 1967 and 1975.[13] Energy developments -- especially strip mining -- will be growing competitors for land even as rising energy prices make some agricultural land uneconomical for farming. Millions of acres of agricultural land are afflicted with severe erosion problems, and these are likely to become more severe as marginal lands are brought into production. For example, the USDA estimates that the 8.9 million acres of land brought into production in 1973-74 due to high commodity prices averaged topsoil losses of 12 tons per acre per year -- two and a half times the highest acceptable rate for sustained productivity.[14] In addition, some land suffers from other problems, including 400,000 acres of land with serious salt build-up in the San Joaquin Valley. Air pollution is afflicting more cropland annually, with damage already estimated to be in the hundreds of millions of dollars to crops and forests.[15] And in parts of the West, continued water supplies for present levels of irrigation are in question.[16]

Yet, urban encroachment onto agricultural land *is* a significant part of the problem of farmland loss. The Soil Conservation Service (SCS) of the USDA has estimated that nationally about 17 million acres of land were converted to "urban and built up areas" between 1967 and 1975.[17] Another 24 million acres were out of production and "being held for urban use," some of it over a longer term than the eight years studied.[18] In other words, over two million acres of land -- the equivalent of all the remaining farmland in the Bay Area -- were converted to urban uses each year in the United States as a whole. About 60% of it was in Capability Classes I-III (i.e. excellent and good cropland), although only about 30% of it was actually being used for crops immediately prior to development. If the land taken out of production as urban reserve was similar and expanded at the same rate, about one-third of the 31 million acres of net cropland loss between 1967 and 1975 can be attributed to urbanization -- and can be considered permanent.

If grazing land is considered, the impact of urban development on agricultural land is undoubtedly even higher than the SCS estimated. Furthermore, in some regions urban development has even more dramatic impacts on farmland. A USDA study of western states' urbanization in the 1950's and 1960's reported that 76% of the land converted to urban uses during the study period had previously been cropland. An additional 18% had been grassland.[19] Only 4% had been forest, and even less -- two percent -- had been "idle." In short, 94% of the land urbanized in the western states during the study period came from agriculture -- irreversibly.

The point here is that among the competing activities that require land, urban development is significant, and its impact on agricultural resources is often disproportionate to the area it actually needs. According to the SCS estimates cited above, the United States lost over 7% of its cropland base in just eight years. One-third of this loss, or 2.5% of the total, was due to urbanization.

The Bay Area is part of this problem and is typical of American metropolitan areas in several ways. Its agricultural activity is significant and it is threatened by urban expansion. The loss of United States farmland is ultimately of national and even international significance, but it is still the responsibility of the jurisdictions where it occurs -- including those of the Bay Area -- to protect their own and the nation's agricultural resources.

While it may be possible to reduce the amount of farmland lost to other causes, or to reclaim some agricultural land, the long-term protection of agricultural resources also requires that losses due to urbanization be reduced where possible. But in order to examine how such losses might be reduced, it is necessary to investigate the process by which land is converted from farms and ranches to cities and suburbs.

NOTES

1 U.S. Bureau of the Census. Statistical Abstract of the United States 1978. Washington D.C. 1978. p. 692, and Census of Agriculture 1974.

2 Ibid.

3 California Department of Food and Agriculture. California Principal Crop & Livestock Commodities, 1978. pp. 4 - 12.

4 U.S. Bureau of the Census. Census of Agriculture 1974 - Special Reports, v. 4, Part 2. Ranking Counties and States, Table 4, p. 4.

5 Ibid. Tables 5-7, pp. 5-7.

6 County Agricultural Commissioners, Agricultural Crop Reports, 1978. From POS Background Paper #1. Land area estimates from California County Fact Book 1976-1977, p. 18.

7 U.S. Bureau of the Census. Census of Agriculture 1974 - Special Reports, v. 4, Part 2. Ranking Counties and States, Table 1, p. 1.

8 From County Agricultural Commissioners' Reports, summarized in: California Department of Food and Agriculture, "California Principal Crop & Livestock Commodities 1978," p. 16.

9 Association of Bay Area Governments (ABAG), "Agricultural Resources Study," August, 1969, p. 1.5.

10 Otte, Robert C. "Farming in the City's Shadow." U.S.D.A., Economic Research Service. Agricultural Economics Report No. 250. Washington, D.C., February 1974. pp. 11-12.

11 A county becomes an SMSA or part of an SMSA when a city within it reaches a population of 50,000.

12 California State Department of Finance, Population Research Unit: "Population Estimates for Calfiornia Counties." December 19, 1978. Table 3.

13 Dideriksen, Raymond I. et al. "Potential Cropland Study." USDA Soil Conservation Service. Statistical Bulletin No. 578. 1977. p. 1.

14 U.S. General Accounting Office. "Preserving America's Farmland -- A Goal the Federal Government Should Support." CED-79-109. Washington, D.C. 1979. p. 21.

15 American Land Forum, Report No. 1. "Land and Food: The Preservation of U.S. Farmland." Washington, D.C., Spring 1979. p.25.

16 U.S. General Accounting Office. Op. Cit. pp. 17-19.

17 Dideriksen, Raymond I. et al. "Potential Cropland Study." USDA Soil Conservation Service. Statistical Bulletin No. 578. 1977. p.2.

[18] Ibid. p.2.

[19] Dill, Henry W. Jr. and Robert C. Otte, "Ur .tion of Land in the Western States. " USDA Economic Research Ser eport 428. 1970.

Chapter Four: THE AGRICULTURAL LAND CONVERSION PROCESS: TWO CASE STUDIES

A. The Farmland Conversion Process

Urbanization tends to impact nearby agriculture in a number of ways that may cause farmland to go out of production. Farmers' costs may be raised -- or their returns reduced -- by frictions with residential or other urban activities adjacent to their operations. Trespass, vandalism, and harassment of livestock by domestic pets may be problems even at low densities of urban development. At somewhat higher densities, suburban residents may enact ordinances to restrict farm activities that generate dust, noise, odors, or pesticide spraying. Traffic may interfere with the movement of farmmachinery, and the division of land into smaller parcels may make it difficult for a farmer to expand efficiently. Most important, however, the intrusion of urban activities into an agricultural area fosters uncertainty and discourages long-term agricultural investment. It also contributes to land speculation that farmers can usually ill afford and that, as rural landowners, they often cannot resist participating in.

Agricultural land conversion takes place through a "push-pull" process, then. If negative impacts are severe enough, agricultural operations may become unprofitable. If land prices rise high enough, even profitable agricultural operations may be converted to urban developments, especially if local government policies facilitate sprawl. Depending on the conditions in particular situations, agricultural land conversion may take any of the following forms:

1. Direct conversion. When houses, roads, shopping centers, factories and other structures are built on agricultural land, it is converted directly to urban uses.

2. Idling. Agricultural land may fall idle as a result of nearby urbanization, for a number of reasons. It may be too heavily impacted by conflicts with adjacent urban development to be economically attractive for farming, or it may be owned by speculators waiting for a satisfactory development opportunity. It may be divided into parcels too small to farm, or may become too isolated from supporting agricultural services to be profitable. Sometimes such land is surrounded by urban development for many years before it is developed itself.

3. Parcelization. Sometimes agricultural land is functionally converted to urban uses, even though it may appear to remain open and productive. This is typically the case when agricultural land is subdivided into "ranchettes" of various sizes that are primarily large-lot homesites. As distinguished from small farms, which can be highly productive, ranchette development removes land from the agricultural land base and the agricultural economy without converting it directly to dense urban development.

4. Urban-related Open Land. Some urban activities require undeveloped land that may come from agriculture. Watershed protection, major parks, and major institutions may take agricultural land out of production without actually developing it. Of course, where compatible such land is often leased back to agricultural operators and actually contributes to a stable agricultural land base. But in a few cases, these activities may introduce some of the same conflicts as urban development in general.

General Studies of Urban Land Requirements in California

A number of land use studies have attempted to estimate the amount of urban land needed to accommodate future population growth in California, although only a few have focussed on the more specific question of what the impact of urban development on farmland was likely to be. Unfortunately, such land use studies are rarely directly comparable because of differences in methodology, time frames, and (especially) definitions used. With this in mind, it is still useful to compare the range of land use estimates made in different studies. This range at least suggests the "ballpark" within which more specific Bay Area estimates can be evaluated.

One author has compared six land use studies, five of which focussed on California and included projections of future needs. The sixth estimated past urban land expansion in 48 counties in Western States, and broke its estimates down into different categories for counties that were not in Standard Metropolitan Statistical Areas (SMSA's), counties that were themselves SMSA's (e.g. Santa Clara), and counties that were part of multi-county SMSA's. These estimates are summarized below.

Study	Increase in Urban Acreage per 100 increase in population	Time Covered	Comments
Shumway	11.9	1965-80	Projections based on air photos
Rao	12.8	1960-70	Projections
Eckbo	14.2	1960-80	Projections
Foley	20.0	1960-80	Projections
Dill & Otte (overall)	7.1	Approx. 1950-60	Air photo measurements of past trends
(Multi-Co. SMSA's)	5.2		
(One-Co. SMSA's)	10.0		
(Non-SMSA's)	12.8		

The two lowest estimates were based on air photo comparisons and included only land actually built on or paved for urban uses. The higher projections were based on more general definitions of "urban" and may have included some agricultural or idle land within this category.

Of course, the amount of land converted to urban uses depends on more than simple population increase. Other important factors are: the rate of population increase, topography, socio-economic characteristics, climate, total population, and travel times to other activities. Estimating the amount of land increase required per 100 new people simply provides an easy way to standardize different projections for comparison. Specific estimates must then be adjusted for other influences.

Source: Shumway, C. Richard. "Urban Expansion on Agricultural Land in California." Agricultural Economics Series No. 71-3. University of California Agricultural Extension Service. October, 1971. p. 16, Table 4 and p.7.

How significant are these various forms of farmland conversion? Most studies of farmland loss deal only with the easiest to measure and most obvious form of farmland loss: direct conversion to urban development. It has been estimated, however, that for each acre of land paved over for urban uses, an additional one-half acre to one acre of farmland may also go out of production due to the indirect impacts of development.[1]

The question of how much land is converted directly to urban uses compared to the total amount of agricultural land that is affected by urbanization is important because the answer influences the type of action that is needed to reduce farmland loss. If, for example, a great deal of agricultural land is being used for single-family houses on ranchette-size lots, an appropriate measure to reduce the amount and rate of farmland conversion might be to permit and encourage clustered, smaller lots in the area. If farmland conversion results primarily from the scattered location of high density development, it would be more effective to try to improve the location of development, rather than simply increasing its density.

In order to illustrate the process of farmland conversion and to estimate the various types of farmland loss for the Bay Area, it is necessary both to rely on general studies, and to examine particular Bay Area examples in more detail.[2] Estimates of magnitudes for the types of conversion described above will be developed for the region as a whole to try to "account for" the land that has gone out of agricultural production since 1949. U.S. Census of Agriculture figures, adjusted to exclude non-productive land in farms,[3] are used as the basic measurement of farmland loss. Estimates of the magnitude of direct conversion and idling are developed from the Santa Clara County case study. The importance of parcelization and its possible future magnitude are described in the Sonoma County case study. Urban-related open space varies greatly between counties, and there is fairly good regional data available on it. Therefore, this fourth type of conversion is estimated for the region as a whole directly in the next chapter.

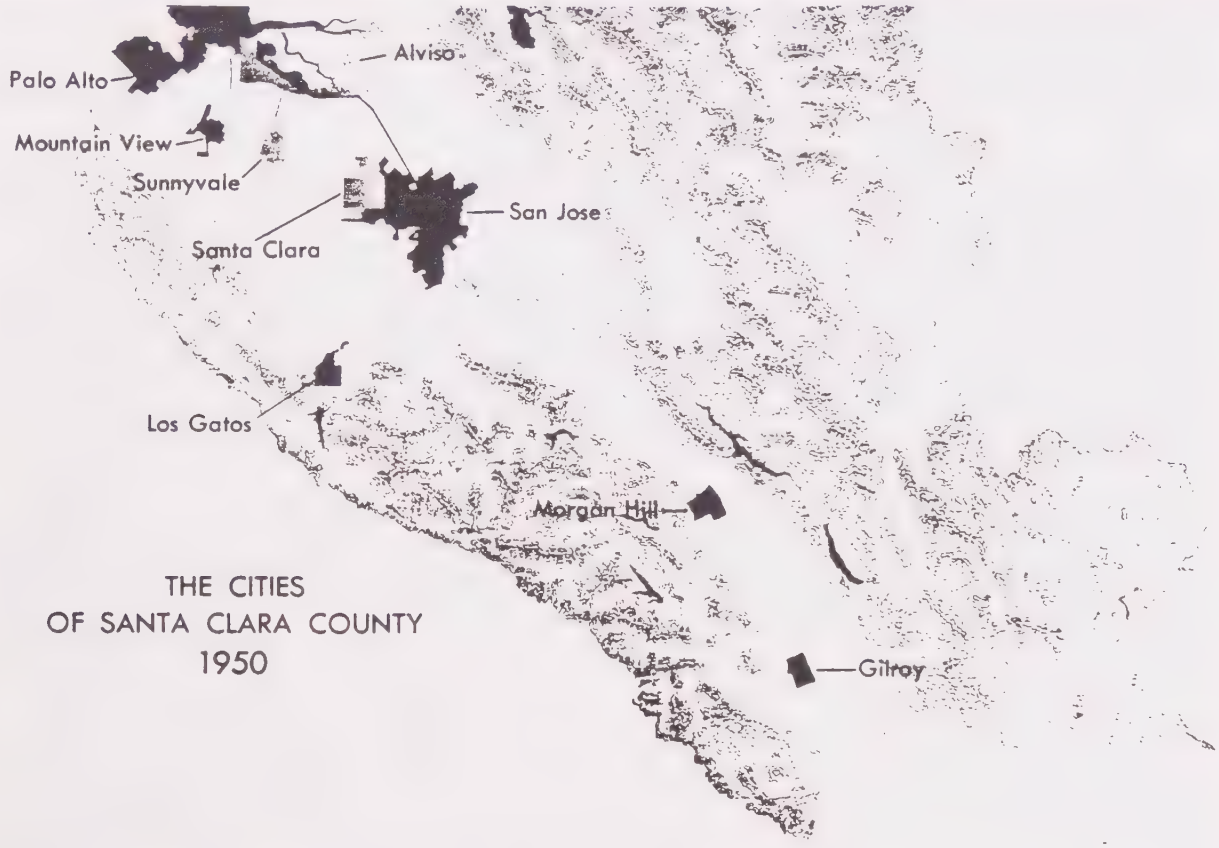
B. Santa Clara County: Direct Farmland Conversion

Santa Clara County has been well-known since the 1950's as one of the most rapidly urbanizing areas in the United States. It was also well-known, of course, as a major agricultural center prior to World War II. In fact, the county is still a major producer of certain commodities (apricots, cucumbers, flowers, lettuce, mushrooms, peppers, and tomatoes, to name some), and is still growing rapidly. Consequently Santa Clara County is a good place to observe agricultural land conversion.

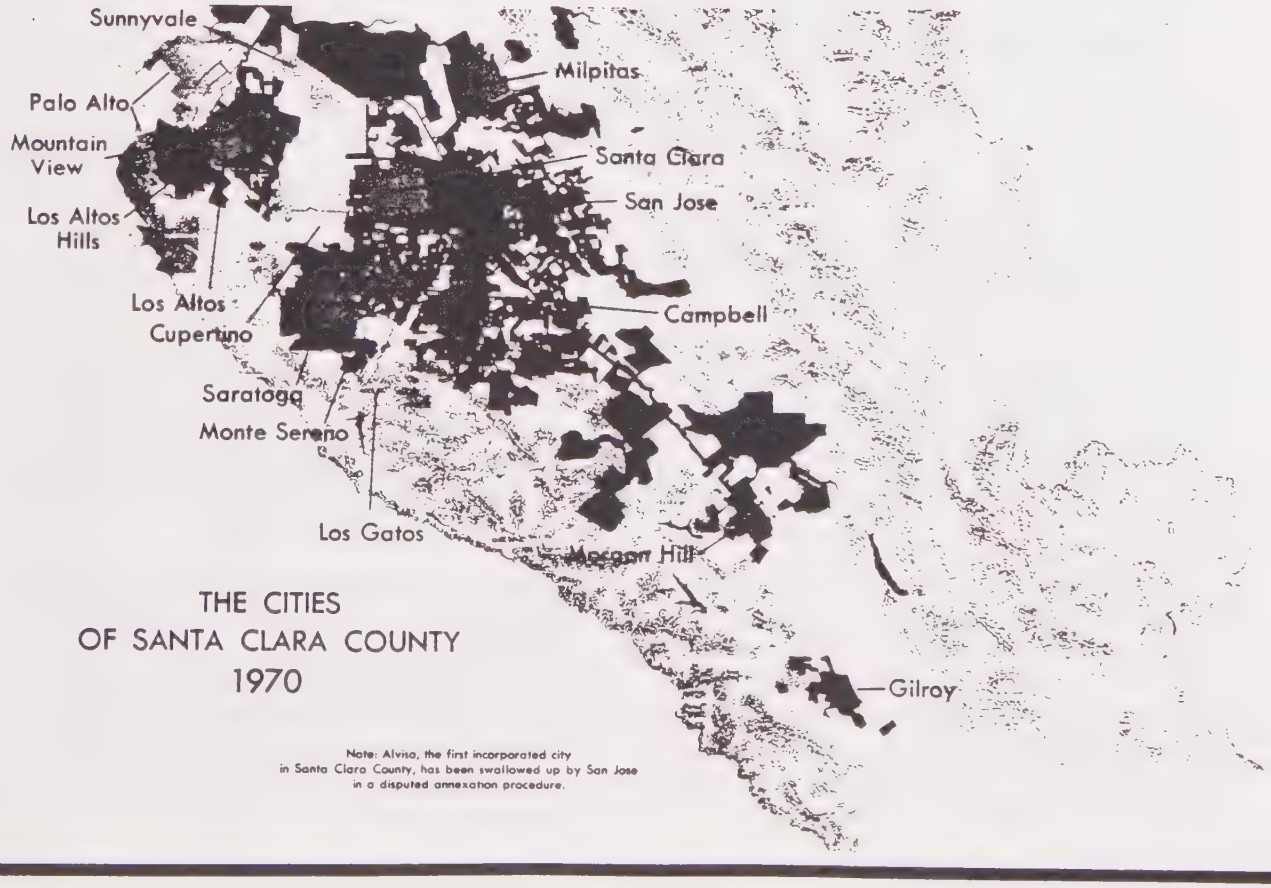
According to the United States Census of Agriculture, the land in agricultural use (including grazing) in Santa Clara County declined from about 499,200 acres in 1959 to 380,350 acres in 1974. Meanwhile, the population[4] of the county increased from an estimated 601,600 to 1,157,300. This amounts to farmland loss of 21.4 acres per 100 increase in population, or 7,900 acres per year.

Various studies of urban land requirements in California and the Western United States have estimated that the amount of land required for urban uses ranges from 7.1 acres to 20.0 acres per 100 increase in population. (See box, facing page.) Using this range as the "ballpark" within which more specific Bay Area estimates can be evaluated, it is unlikely that all the farmland that went out of production in Santa Clara County between 1959 and 1974 was converted directly to urban uses. So, how much land was consumed for urban development in Santa Clara County in recent years?

FIG. 7



THE CITIES
OF SANTA CLARA COUNTY
1950



THE CITIES
OF SANTA CLARA COUNTY
1970

Note: Alviso, the first incorporated city in Santa Clara County, has been swallowed up by San Jose in a disputed annexation procedure.

From: Cry California, Fall 1970

1. Direct Conversion: About One-Third

Several studies of land use changes have covered the county at various periods during the last 30 years. Their estimates of urban land converted per 100 new people in the county are generally close to the "ballpark" of estimates suggested earlier. They range from a low of 6.4 acres to a high of 26.5 acres per 100 increase in population, as shown in Table 4. The lowest per capita increase in urban area is for the earliest time period covered, while the highest is for the latest period covered. These estimates in part support the general observation that urban development has been decreasing in density even in recent years, although the estimates are too far apart for decreasing densities to account for the entire difference between them.

Two of the estimates are within the boundaries of land requirements suggested by the general studies, and at 8.1 and 9.4 acres per 100 increase in population, they are quite close together.

Table 4

SANTA CLARA COUNTY: ESTIMATED INCREASES IN URBAN LAND AREA

Study	Time Period	Urban Acreage Increase	Population Increase	Acres/ 100 pop. Increase	Comments
Zeimetz, et al.	1956-63	+28,098	346,500	8.1	From air photos
Dill & Otte	1950-1963	+33,150	519,900	6.4	From air photos
Santa Clara Co. Planning Dept.	1962-1967	+21,609	229,000	9.4	From county-wide land use inventories, 1962 & 1967; Assessor's parcels field-checked for land use.
Calif. State Dept. of Water Resources	1967-1978	+66,138	249,600	26.5	From acreage tabulations of maps at 1:24,000 based on air photos

Sources: Zeimitz, Kathryn A. et al. "Dynamics of Land Use in Fast Growth Areas." Economic Research Service, USDA. Agricultural Economics Report No. 325. Washington, D.C. 1976. Unpublished data.

Dill, Henry W., Jr. and Robert C. Otte. "Urbanization of Land in the Western States." Economic Research Service, USDA. ERS-428. 1970

Santa Clara County Planning Department. "1962-1967 Land Use Trends, Santa Clara County." Info Sheet #351. June 1970.

Population estimates for Zeimetz, Dill & Otte, and Department of Water Resources from California Department of Finance, Population Research Unit. For July 1 of each year.

California Department of Water Resources, original data, 1967 and 1978.

The closeness of these two estimates is all the more remarkable because they were determined by different methods. Santa Clara County inventoried land uses in 1962 and 1967 by field-checking the activities taking place on most of the assessor's parcels in the county.[5] The Zeimetz study, on the other hand, used air photos from 1956 to 1963 to measure land use changes. Although the published Zeimetz study included Santa Cruz County and agregated it with Santa Clara, the original data for Santa Clara County was obtained from the author and used to derive the estimates in this report.

The Zeimetz study and the County's study, then, indicate that during the

FIG. 8

FARMLAND LOSS TO URBANIZATION

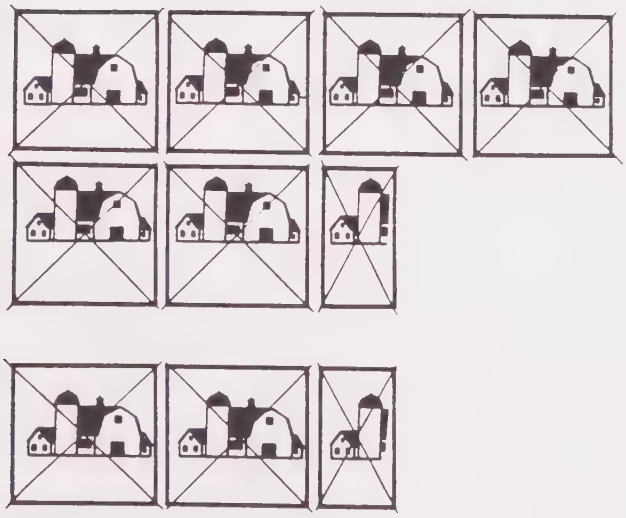
+ 100 pop.

=

6.4 acres

+

2.4 acres



Developed

Idled

8.8 acres of farmland lost to urbanization from an increase in population of 100 persons

(Based on data for Santa Clara County, 1956-63)

Source: Zeimetz, 1976

1950's and 1960's at least 8.1 acres of land were urbanized for every 100 increase in population in Santa Clara County. If anything, this estimate is on the conservative side, especially compared to more general studies and to the California Department of Water Resources' measurements of land use changes in the county from 1967 to 1978. Therefore, it seems a reasonable estimate to work with to determine agricultural land conversion. Of course, not all the eight acres developed were necessarily in agricultural use originally. Fortuantely the Zeimetz study covered land use changes in general and therefore the amount of agricultural land urbanized can be deduced from its data. About 6.5 of the 8.1 acres urbanized for each 100 new people in Santa Clara County -- or 80% were originally agricultural, according to the study.

If the findings of the Zeimetz study held true over a longer period, the consumption of land for urban uses would account for about one-third of the 21.4 acres of agricultural land lost from production per 100 increase in population between 1959 and 1974, according to the U.S. Census of Agriculture. Interestingly the Zeimetz study itself estimated that a much smaller amount of agricultural land went out of production during its study period, but that urbanization accounted for about three-quarters of the farmland loss it detected.

There are several possible reasons why the estimates of agricultural land loss differ between the Ziemetz study and the U.S. Census, including sample errors, difference in time period covered, and in the way the information was generated.[6] In any case, it is clear that not all the land that went out of production in Santa Clara County during the 1950's and 1960's was converted to urban uses. As much as two-thirds of the land loss remains unaccounted for. Some of this land was undoubtedly idled, that is, taken out of production, but not urbanized. Idling of agricultural land can occur for many reasons, but one reason it occurs is the "shadow" of uncertainty that urbanization casts across nearby lands. Land use conflicts, more speculative landowners, and reluctance to make long-term agricultural investments all contribute to urban-related idling. How much agricultural land loss is accounted for by idling in the case of Santa Clara County?

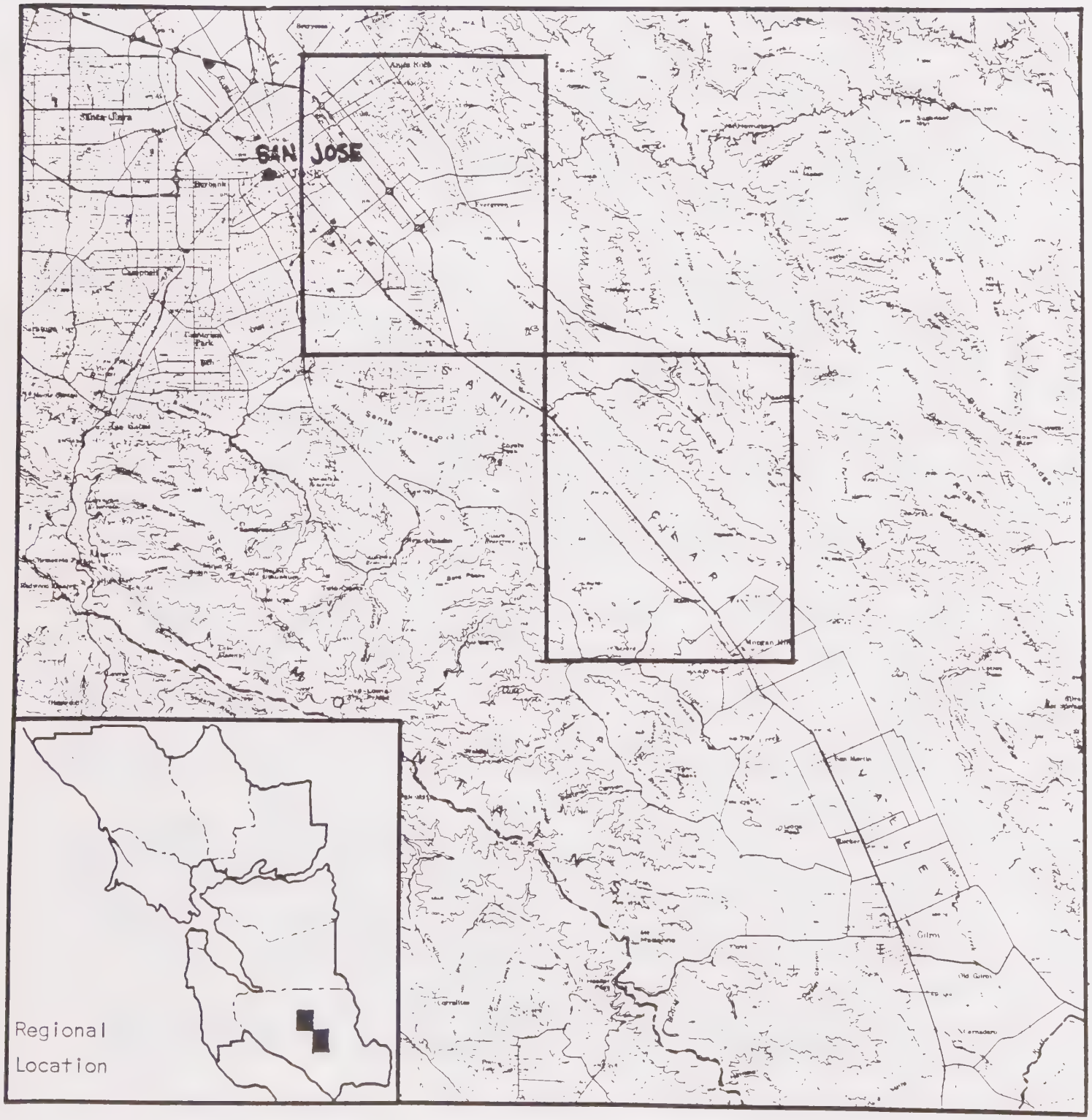
2. Idling: Part of the Urban Shadow

Urbanization can cause agricultural land to be idled, but it is not the only cause of idling. Agricultural land may also be idled due to economic conditions for particular crops, or local problems, such as drought, plant disease, or relatively poor soils. Consequently, it is not sufficient to determine how mcuh agricultural land in Santa Clara County was idled; it is also important to know whether urbanization was the reason for its withdrawal from production.

The Zeimetz study estimated the amount of idle agricultural land in Santa Clara County. It indicated that for every acre of agricultural land developed for urban uses during the study period, about four-tenths of an acre fell idle. In relation to population, for every 100 new people, 6.4 acres of agricultural land were urbanized and additional 2.4 acres of agricultural land were idled. In total, then, about *nine acres of agricultural land went out of production per 100 increase in population.*[7] This effect is illustrated in Figure 8.

But how much of the increase in idle agricultural land was caused by urban development? There were some changes in land use taking place within the agricultural sector in the 1960's and 1970's. Orchards in particular were

LOCATION OF SANTA CLARA COUNTY STUDY AREA



experiencing increasing competition from Central Valley growers during this period and orchard acreage declined by more than 50,000 acres between 1959 and 1974.[8] Maps of crop changes in the South Santa Clara Valley, where urbanization pressures were relatively light, show that between 1967 and 1978 large acreages of orchards were removed, and the land was replanted in vegetable crops.[9] But the data shows that very little of this land was idled or abandoned due to the unfavorable conditions for tree crops; instead it was shifted into other commodities. Considerable evidence suggests that farther North in the Valley, however, urbanization disrupted this process: instead of being replaced by other crops, orchard lands near expanding San Jose were more likely to be taken out of production entirely and left idle. Although urban development did not necessarily cause the removal of orchards, it appears to have caused the idling of land that had been in orchards and would otherwise have been replanted in other crops.

This impact of urbanization on idling of agricultural land in Santa Clara County was determined by examining original land use information from the California Department of Water Resources for two areas at two different points in time. The first area covered eastern San Jose and extended almost as far South as Coyote Narrows (East San Jose, for short). The second covered an adjacent area further South in the Valley, from the town of Coyote to Morgan Hill (Morgan Hill, for short).[10] Each area comprised about 38,000 acres (60 square miles).

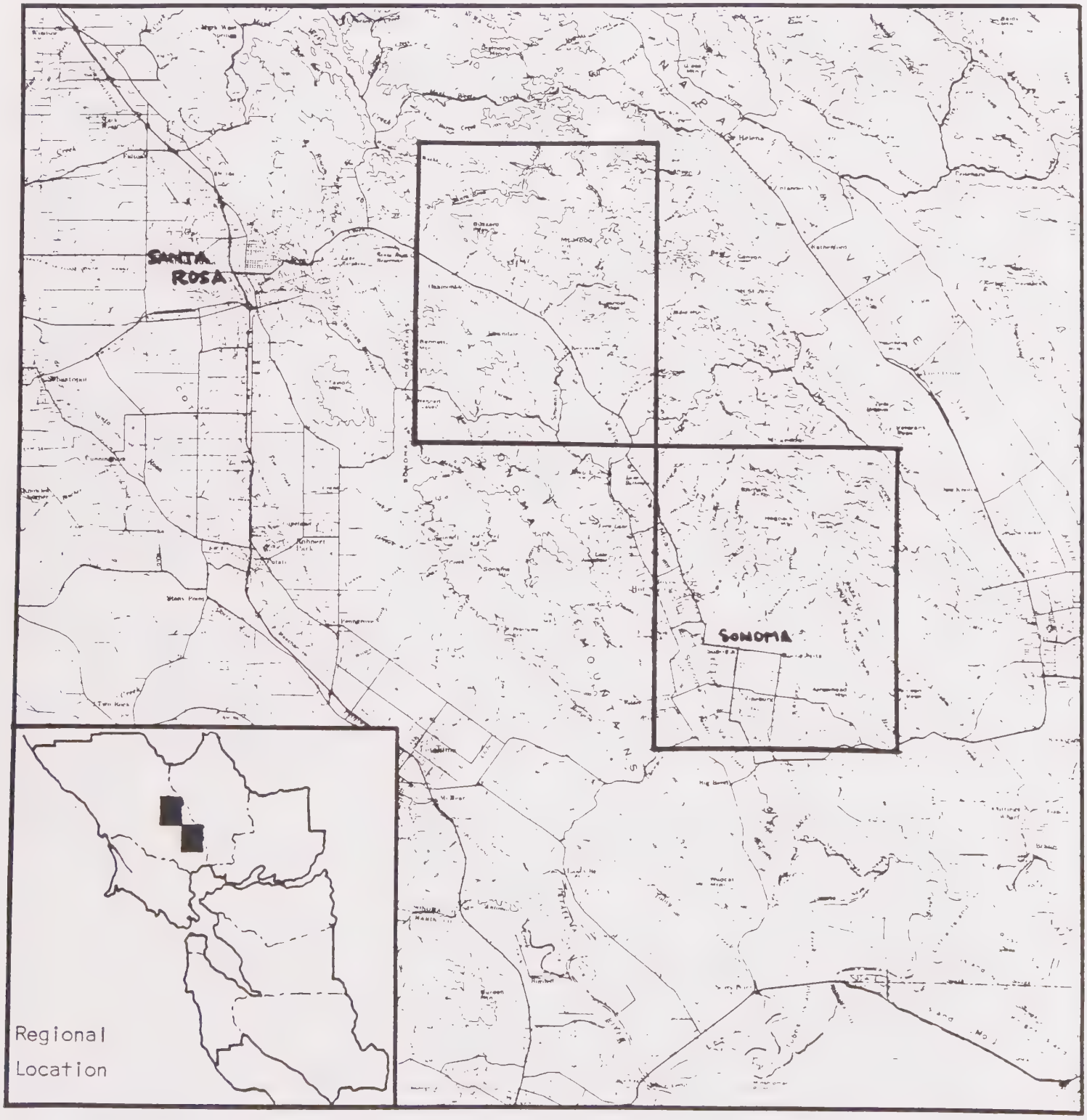
In 1967, the East San Jose area had more acres in orchards than the Morgan Hill area (7,652 compared to 6,008 acres) even though it also had a lot more urban development (11,427 acres compared to only 781 acres in Morgan Hill).[11] By 1978, the agricultural situation was reversed: Morgan Hill had more acreage left in producing orchards than East San Jose (2,767 and 1,824 acres, respectively). East San Jose however, had 3½ times more <u>abandoned</u> orchard acreage than Morgan Hill in 1978.

For vegetable crops, the pattern of change was similar, but even more dramatic. In 1967 East San Jose had been the leader in vegetable acreage (with 1,427 acres to Morgan Hill's 1,048 acres). By 1978, East San Jose's vegetable acreage had been cut in half but Morgan Hill's had expanded and almost doubled. Interestingly, the amount of orchard acreage lying <u>idle</u> in East San Jose (927 acres) could easily have replaced the decline in vegetable acreage in that area; but it didn't.

Meanwhile, both areas experienced an increase in urban development. Morgan Hill's urban area grew by about 980 acres; East San Jose's grew by 8,600 acres, almost nine times as much not counting 3,900 acres of land classified by the Department of Water Resources as "unpaved urban vacant."[12]

The specific location of idled agricultural land confirms that urban impacts or anticipated development were major causes of agricultural idling in Santa Clara County. An analysis of the location of land classified by the Department of Water Resources in 1978 as "abandoned" agricultural land (untended orchards) was conducted for the same areas described above. Of the "abandoned" land, 82% was contiguous to urban development on at least one side. If the additional 3,900 acres classified as "unpaved urban vacant" land is considered idled and isolated agricultural land, the proportion of idle land directly adjacent to urban development rises to 96%. Moreover, the remaining idle agricultural land not contiguous to urban development was in parcels

LOCATION OF SONOMA COUNTY STUDY AREA



averaging only 12 acres in size. In other words, much of this land was probably indirectly affected by nearby urbanization through parcelization.

This is strong evidence that almost all the agricultural land that was idled (not just shifted from one crop to another) in Santa Clara County in recent years was impacted by nearby urban development; it was not necessarily different from nor inferior to land that remained in agricultural production. Very few crops can come close to competing for land against even suburban density development. In fact, Santa Clara County, with its favorable situation for agriculture and its well-developed agricultural economy, may have experienced much less idling during its decades of suburban growth than a less favored agricultural area undergoing urbanization would have.

The Zeimetz study covered the period 1956-63. If the relationships indicated held true for the slightly longer period 1959-74, then 42% of the farmland loss recorded by the U.S. Census of Agriculture for Santa Clara County could be attributed to urban development; about 32% was due to direct urban conversion, and about 10% was due to urban-related idling.

These figures suggest that a considerable amount of farmland may be lost unnecessarily to urban development through idling. They also imply that a great deal of land is lost to other causes, including parcelization and/or urban-related open land uses. To look more closely at parcelization and its impacts, we now turn to another area, Sonoma County.

C. Sonoma County: Parcelization, Pocket Vineyards and the Future

Sonoma County is at the opposite end of the Bay from Santa Clara County -- about as far away as it could be geographically and still be part of the Bay region. When it comes to agricultural land loss, however, Sonoma is not far at all from Santa Clara County. Between 1949 and 1974 about 133,000 acres of agricultural land in Santa Clara County went out of production.[13] In Sonoma County, an almost identical amount, 132,500 acres, went out of production.[14] This similarity is especially remarkable because Santa Clara had more than six times[15] the population increase of Sonoma County during this period.

The amount of agricultural land that went out of production in Sonoma County reflects two major types of urban land conversion. The first is direct conversion, which was discussed in a preceding section. Despite Santa Clara County's reputation for urban sprawl, on a per capita basis such urban development in Sonoma County actually consumed two-thirds more land, according to one USDA study.[16]

In addition to land that was urbanized directly (although at low densities), a considerable amount of agricultural land in Sonoma County appears to have been removed from production by the second type of conversion -- "parcelization." This land has been fractured into small parcels that are often primarily large lot homesites, and agricultural only secondarily. Why parcelization is a problem for agriculture and its impact on example areas in Sonoma County are the main focus of this section.

1. Parcelization: The General Problem

Farms and ranches are usually composed of a number of parcels of land in varying sizes, often with different owners. Large and small parcels are

necessary to permit agricultural operations to expand or contract in response to changing conditions. But the division of too much land into small parcels can make it more difficult and costly to assemble adequate amounts of land in reasonable proximity to constitute a farm or a ranch. Scattered development of small parcels can introduce some of the same land use conflicts as urban development generally.

Most important, however, small parcels contribute to generally higher land prices. When zoning regulations permit one dwelling unit per parcel, as they do in Sonoma County's (and most of the Bay Area's) agricultural zones, small parcels have an inherently higher per acre development value than large parcels.[17] When land for rural residences is in demand, as it is in most of the Bay Area, the agricultural market for small parcels is overshadowed by the urban market for this type of land. Consequently, it is harder for farmers to expand or get started in areas where parcelization has occurred, even if few parcels have actually been developed. When the parcels are developed, each new house can remove relatively large amounts of land from the agricultural economy, even though the majority of the parcel may be left open and seemingly agricultural. Parcelization causes problems for agriculture whether or not the parcels are developed with rural residences.

Furthermore, unless a small parcel is surrounded by a large agricultural operation (not typically the case in the Bay Area), once it is developed with a house the small parcel is unlikely to be re-assimilated by the agricultural land market. Moreover, some part-time farmers buy uneconomically small agricultural parcels at prices above agricultural values to enjoy a rural lifestyle. They may not be willing or able to subsidize the operation indefinitely. Often they anticipate development as an economic "safety net," or as a long-term option for themselves or their heirs. For these reasons, many small "farms" in Sonoma County (and the Bay Area generally), even though still productive at present, may in fact be in the process of removing agricultural land from production.

2. The Magnitude of Parcelization in Sonoma County

Parcelization is not always easy to recognize, because the productivity of agricultural land varies so greatly and the prices of agricultural commodities can differ widely. This means that twenty acres of vineyard land in the Sonoma Valley can often be more efficient and productive for agricultural use than 100 acres of rangeland only a few miles away. Consequently, 100 acre parcels alone might be too small for continued agricultural use as rangeland, while 20 acre parcels may not be too small for some types of cropland. Therefore the adequacy of parcel sizes for agricultural use can only be determined in relation to the type of agriculture the land is suited for. A more general indicator of parcelization is economic: how much revenue does the parcel produce?

According to the U.S. Census of Agriculture, about 54,650 acres of Sonoma County agricultural land was in "farms" and "agricultural operations" producing less than $2,500 worth of agricultural commodities in 1974.[18] This represents 15% of the productive agricultural land in the County. These small producers are most likely to be exhibiting the effects of past parcelization. They are also more likely than larger farms to be the residence of the

farm operator.[19] The significance of the small farms is that they encompass a large proportion of the total agricultural land in Sonoma County, and they may well represent future non-agricultural rural residences.

Between 1965 and 1979, Sonoma County processed about 7,000 applications for minor subdivisions (creating up to 4 parcels each), which added an estimated 10,500 new parcels to the County.[20] The number of new parcels created through the major subdivision process is much higher, totalling about 645 in the unincorporated area in one year alone.[21] Although many of these parcels were created within existing rural residential areas, some cropland and a great deal of grazing land was also divided into rural "ranchette" sized parcels. In fact, not even high value cropland is immune from parcelization and urban development pressures. As in Santa Clara County, superior agricultural resources alone do not ensure that land will remain in agriculture. The Valley of the Moon and Sonoma Valley illustrate this well.

3. Parcelization and the Future

While urban development is a highly visible and readily recognized form of agricultural land conversion, parcelization may not appear to be urban conversion at all. But it is frequently the first step down the road to future urban development, even in areas of very high value per acre cropland.

The Valley of the Moon and Sonoma Valley are a complex mixture of land uses that include vineyards, orchards, grazing land, rural residences, and small rural communities, such as Glen Ellen and Boyes Hot Springs. Much of the area has been divided into relatively small parcels for many years. The area is not as isolated or homogeneous as the major grape-growing areas farther North in the county, the Alexander and Dry Creek Valleys. As a result, the Valley of the Moon and Sonoma Valley are under greater urban pressures.

Most analysts agree that the long-term economic outlook for premium quality wine grapes is very good.[22] Consumption has been increasing rapidly in recent years but on a per capita basis is still far below European levels, especially outside of California. Since the areas that can grow high quality varietal wine grapes are very limited, grape growers in areas like Sonoma County are better able to compete for land against urban uses than most other agricultural operators.[23] Furthermore, vineyards and urban development are more compatible than many types of agriculture.

In parts of the Sonoma Valley, the quality of grapes is high, but yields are low compared to the Alexander and Dry Creek Valleys. However, in the Valley of the Moon, much of the land is as favorable for certain premium varietal wine grapes as any in the County, both in quality and in yield.[24] Yet substantial urban development has already occurred on some of the finest vineyard land in the Valley of the Moon, and urban pressure is considered a problem by some knowledgeable people in the area.[25] An analysis of subdivisions in the Kenwood area shows that, on the land rated highly for grapes by the Soil Conservation Service, it is medium sized parcels that have tended to be subdivided to ranchette-sized parcels. Although this land was not planted in vines, it appears to be highly suitable for fine grapes.[26] Even in a highly attractive commercial agricultural area, small parcels encourage low density development and reduce the amount of land available for expansion of commercial operations. At a time when suitable vineyard land is already developed

elsewhere, the availability of land for expansion will be increasingly important to Sonoma County grape growers. Most of the suitable land for vineyard planting is now in orchards; the size of existing parcels will be a critical factor determining how much orchard land is in fact replanted in grapes. Land that is otherwise suitable but in parcels too small to be attractive to vineyardists will be difficult to retain in agricultural use.[27]

Even if small parcels remain in agricultural use for the time being, there are real questions about the ability of landowners to maintain marginal operations in the long term.[28] Even landowners motivated by the desirability of a rural lifestyle may not be able to manage vineyards well enough on a part-time basis to ensure the long-term survival of the operation.

The problem of parcelization is of course not just limited to Sonoma County. In Alameda County, several large 500+ acre cattle ranches have been broken into 100-acre homesites in the past four years. In Contra Costa County the rich cropland around Brentwood is checkerboarded with 5 and 10 acre parcels -- sizes at or below that usually necessary for efficient vegetable or orchard operations; south of Mt. Diablo, 5 and 20 acre parcels pose the same problems for the fertile dry rangeland in the Tassajara area. Along the road near Nicasio, in West Marin's dairy belt, 60-acre ranchettes are advertised and sold on a regular basis, much to the dismay of many dairymen. In Solano County, the threatened breakup of a large commercial cattle ranch into 20-acre homesites spurred that county to adopt 80- and 160-acre zoning in 1976. There are many other such examples in the Bay Area. In fact, there are only a very few parts of the region where substantial parcelization does not exist as a fact or a very real threat.

The significance then of the parcelization process is two-fold: 1) As the Sonoma case shows, even a very high value agricultural use such as grape growing has severe difficulty in competing against the market for even low-value urbanization (rural residences compared to suburbs); and 2) subdivision of land into increasingly smaller parcels has pronounced negative impacts on the future of any type of agriculture; chief among which are increased land prices, more conflicts with agricultural practices, and the creation of a general attitude of uncertainty toward the agricultural future of a farming area.

While parcelization as an agricultural land conversion problem in the Bay Area is not as widely documented as intensive urbanization, it may in fact become the most difficult one to resolve. From our investigation in this study, it seems clear that, like a ratchet tool, once parcelization becomes too prevalent in a farming area, the only remaining option is further urbanization--and the loss of more agricultural land.

NOTES

1 Plaut, Thomas R. "Urban Growth and Agricultural Decline: Problems & Policies." Unpublished Paper. University of Texas, Austin. 1978. p. 20.

2 The general studies cited were selected because they included a number of Bay Area counties and focussed on the Western states. In national studies, estimates of the impact of urbanization on farmland tend to be skewed downward by non-agricultural land near cities in the Northeast and South.

3 The adjustments to acreage estimates are described in detail in the Appendix to POS Background Report #1.

4 California State Department of Finance. Population Research Unit. Estimates for July 1.

5 Telephone conversation with George Francis, Santa Clara County Planning Department. October 24, 1979.

6 The Census relies on enumerators and mail surveys of landowners' and agricultural operators' own estimates of the land in use. The Zeimetz study used air photos to document land use changes. There is one type of land use that is particularly difficult to classify and which may have been treated differently by the two sources: rural residential "ranchettes." In some cases a parcel with fruit trees and crops for personal consumption, or with horses grazing, may appear "agricultural" from an air photo, even though it is not really in production and would not be considered a farm by the Census. For this reason, the Zeimetz study may have undercounted some agricultural land idling and functional conversion.

7 Zeimetz, Kathryn, et al. "Dynamics of Land Use in Fast Growth Areas." Economic Research Service. USDA. Agricultural Economic Report No. 325. Washington D.D., 1976. Original data.

8 Agricultural Commissioner's Report, Santa Clara County, 1959 and 1974, showed a drop in fruit and nut crops from 79,000 to 24,000 acres.

9 The two maps referred to were prepared by the California Department of Water Resources with the Santa Clara Valley Water District and made available to POS by the Department of Water Resources.

10 This information was based on the 1978 Department of Water Resources maps of land use and acreage tabulations for areas corresponding to the U.S. Geological Survey 7½ minute quads for "San Jose East," and "Morgan Hill." They are at the scale of 1:24,000 and show only cropland as "agriculture." The maps and tabulations were supplied by the Department of Water Resources.

11 "Urban" defined to include the following Department of Water Resources categories: U (except UV1), R, S4 and S5.

12 Department of Water Resources category "UV1."

13 U.S. Census of Agriculture. 1949 and 1974. Figures adjusted to exclude non-productive land in farms.

14 Ibid.

[15] Population changes actually were from 1950-1975; California Department of Finance, Population Research Unit.

[16] Dill, Henry W. Jr. and Robert C. Otte, "Urbanization of Land in the Western States." U.S. Department of Agriculture Economic Research Report 428. 1970. See Table 6 in Chapter Five of this report for specific Bay Area figures.

[17] For a more complete treatment of land value per acre related to parcel size, including particular Sonoma estimates, see: "The Impact of Sonoma County General Plan on Agriculture and Land Values." McDonald and Grefe. Unpublished report to Sonoma County. March 1978, pp. VI-9 - VI-10.

[18] U.S. Bureau of the Census, Census of Agriculture, 1974. V.1 Part 5, County Data Table 1, County Summary Data Table 33. U.S. Census Of Agriculture, County Data Table 1, figures adjusted to exclude non-productive land in farms.

[19] Statewide, 85% of the "agricultural operations" producing less than $1000 were also the residence of the farm operator in 1974, compared to 78% for farms producing $1000-2,500, and 71% for farms grossing more than $2,500. U.S. Census of Agriculture, 1974. Table 9, p. I-6 and Appendix B, p. B-1.

[20] Sonoma County Planning Department. Personal communication. October 1979.

[21] Telephone conversation with Bab Mays, Sonoma County Water Agency. October 8, 1979. For the period July 1978-July 1979.

[22] Interview with Bob Sisson, County Farm Advisor specializing in viticulture, October 15, 1979, Agricultural Investment Letter, July/August 1977. Agland Investment Services, Inc., San Francisco.

[23] Bob Sisson; U.S. Department of Agriculture Forest Service and Soil Conservation Service, Soil Survey, Sonoma County. Washington, D.C.: U.S. G.P.O., 1972.

[24] Bob Sisson.

[25] Sonoma County Farm Bureau, "Position Paper on Land Use," Santa Rosa, California. May 1979. p. c-5.

[26] Department of Water Resources maps of the Kenwood area in 1952 and 1974 were compared with Soil Conservation Service maps and parcel maps for 1971 and 1975 from the County.

[27] This was the consensus among experts from the area.

[28] This was the consensus among experts from the area.

Chapter Five: DISAPPEARING FARMLAND IN THE BAY AREA

FIG. 10

BAY AREA FARMLAND LOSS

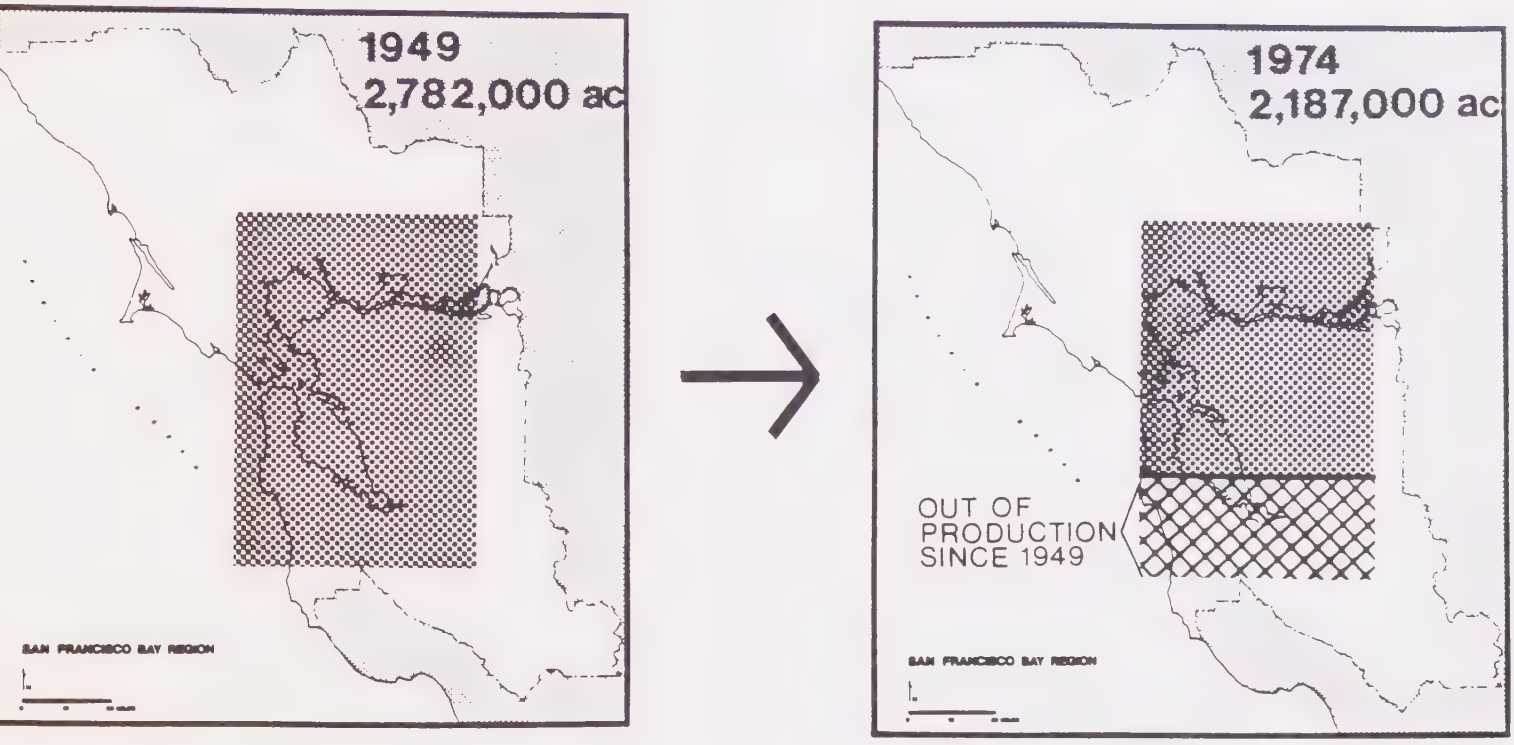


Table 5

BAY AREA FARMLAND LOSS: 1949 - 1974

County	Cropland Change	Pasture and Range change*	Total Ag Land Change	Population Change (1950-74)	Acres Lost/ 100 Increase in Population
Alameda	-48,550	+ 26,940	- 22,065	345,300	6.4
Contra Costa	-70,885	+ 2,732	- 68,153	276,900	24.6
Marin	-13,076	- 76,263	- 89,339	125,500	71.2
Napa**	-31,510	- 63,505	- 95,015	41,600	228.4 (108 w/o Berryessa)
San Mateo	-18,326	+ 16,836	- 1,490	333,900	.4
Santa Clara	-121,538	- 11,523	-133,106	860,700	15.5
Solano	+ 140	- 53,332	- 53,192	78,000	68.2
Sonoma	-31,330	-101,179	-132,509	138,100	95.9
Bay Area	335,575	-259,294	594,869	2,200,000	27.0

* Apparent increases in rangeland are evidently partly the result of shifts between cropland and pasture, partly due to enumerating changes. They are not shown by Agricultural Commissioners' Reports.

** Lake Berryessa, approximately 50,000 acres.

Source: U.S. Bureau of the Census. Censuses of Agriculture. 1949-1974.
California Department of Finance, Population Research Unit.

See footnote #3.

A. The Last Thirty Years

Between 1949 and 1974 about 595,000 acres of agricultural land went out of production in the Bay Area, according to the U.S. Census of Agriculture.[1] Over half this land was formerly cropland (335,575 acres), while 43% (259,294 acres) had been used for pasture and range. In total, more than one-fifth of the Bay Area's 1949 farmland base went out of production in just 25 years. This amounts to a loss of 23,800 acres per year, or a bite almost the size of San Francisco from the region's farmbelt every year.

The rate of farmland loss was not uniform throughout the region. A few counties even showed slight increases in particular types of agricultural land use at times during this period. But overall, the unmistakable trend was downward in almost every county and in the region as a whole.[2] The pattern of agricultural land use changes are shown for each county and for the region in Figures 12 through 14. Perhaps the most important point to note is that, despite slight recoveries in a few counties, the rate of farmland loss is not decreasing and in fact it has actually accelerated region-wide in recent years, especially for rangeland.

The U.S. Census of Agriculture recorded about 2.3 million acres of "land in farms" in the Bay Area in 1974, of which about 2,187,000 acres could be considered productive, once miscellaneous acreage in woodlands, farmhouses, barns, roads, etc. is subtracted. This is somewhat higher than the most recent estimates available from each county's Agricultural Commissioner. The regional total of the Agricultural Commissioners' estimates for 1978 was 1,846,000 acres of productive farmland, including harvested cropland. (Harvested cropland may be more or less than actual land area, due to double-cropping, land not planted, or crops not harvested for any reason.) Despite this difference, the Bay Area's Agricultural Commissioners' reports confirm the long-term farmland loss trend and the fact that over half the land going out of production in the region is cropland (55%). The Commissioners' estimates of 1978 agricultural acreage suggest that farmland is continuing to go out of production in the Bay Area at a steady pace at least, and possibly at an accelerating rate.

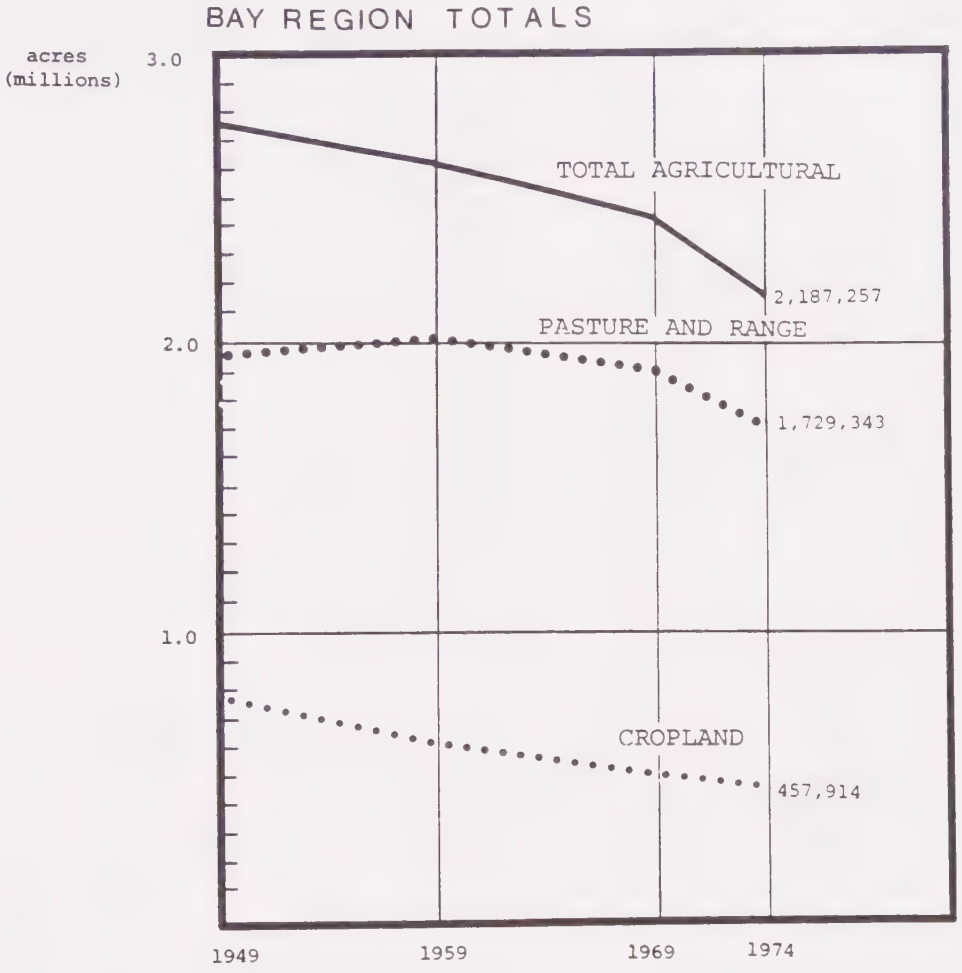
Surprisingly, in relation to population increase, the Bay Area as a whole lost its agricultural land at a somewhat faster pace than fast-growing Santa Clara County during the 25-year period 1949-1974.[3] (See Table 5.) While about 15½ acres of agricultural land went out of production per 100 increase in population in Santa Clara County, the region as a whole lost about 27 acres of agricultural land for each comparable population increase. These estimates are for farmland lost from production for all reasons, and consequently, they are more typical for the region as a whole than they are for any one county. The rate of loss for Napa County, for example, is heavily influenced by the inundation of about 50,000 acres of land by Lake Berryessa. However, it is still noteworthy that the fastest growing county in the region during much of this period was not the leader in terms of farmland lost per capita.

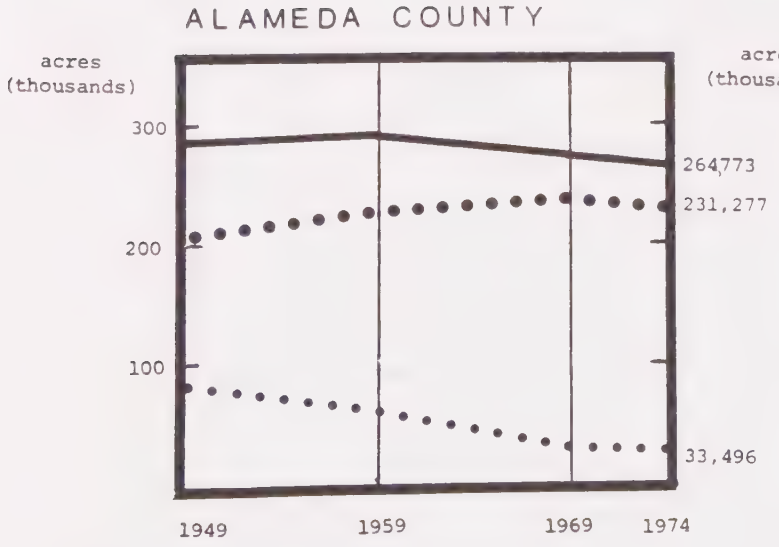
B. Direct Conversion and Idling: One-Third of the Total

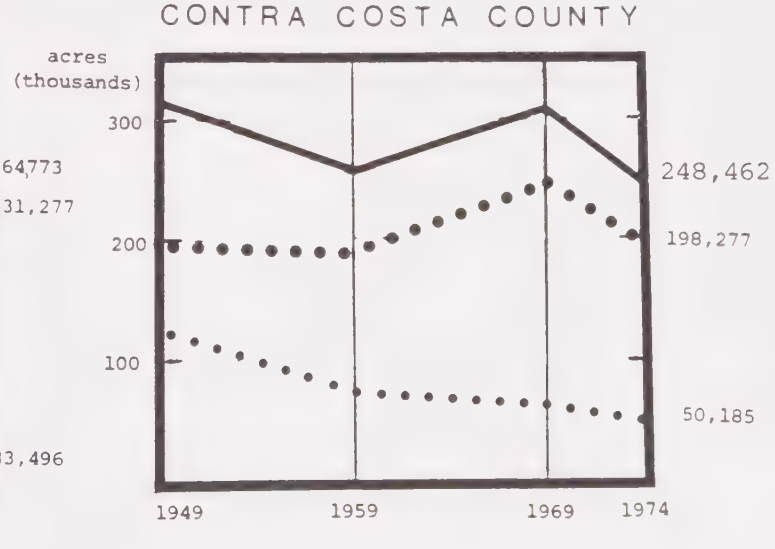
Obviously, as in Santa Clara and Sonoma Counties, not all the farmland that is going out of production in the Bay Area is being paved over for urban

FIG. 11

BAY AREA AGRICULTURAL LAND







Source: United States Census of Agriculture

FIG. 12

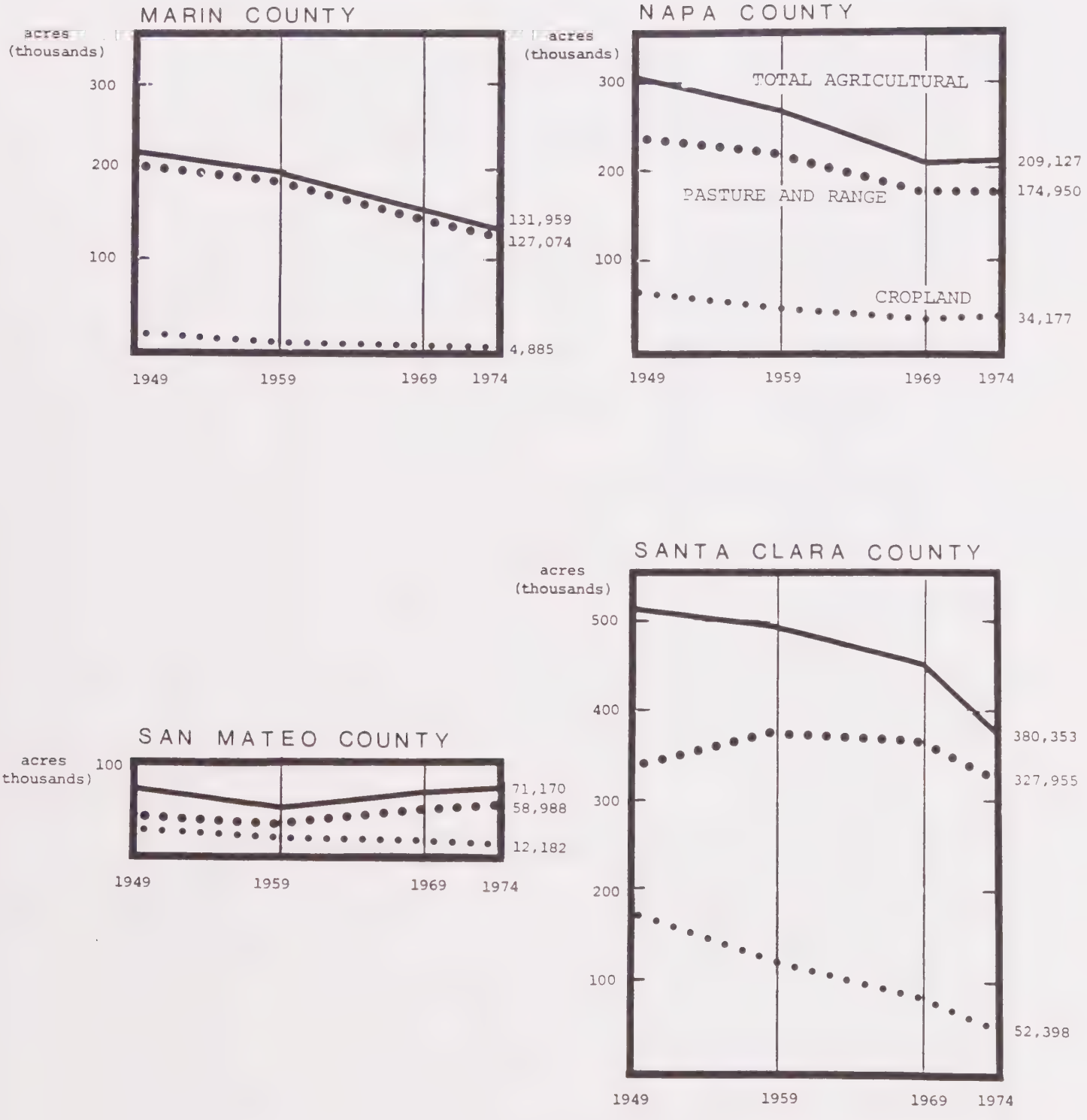
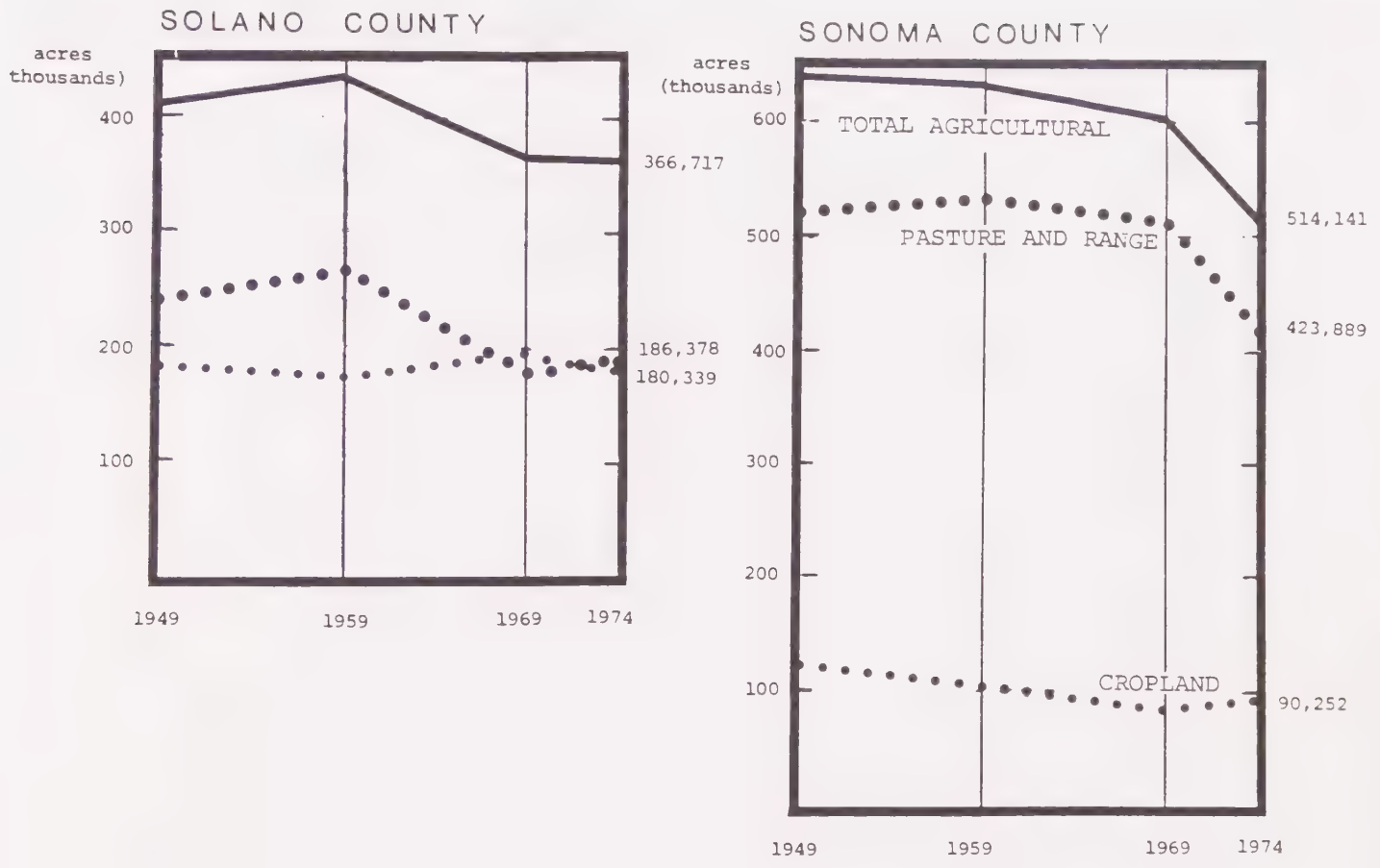

MARIN COUNTY
acres (thousands)
300
200
100
131,959
127,074
4,885
1949
1959
1969
1974
NAPA COUNTY
acres (thousands)
300
200
100
TOTAL AGRICULTURAL
PASTURE AND RANGE
CROPLAND
209,127
174,950
34,177
1949
1959
1969
1974
SAN MATEO COUNTY
acres (thousands)
100
71,170
58,988
12,182
1949
1959
1969
1974
SANTA CLARA COUNTY
acres (thousands)
500
400
300
200
100
380,353
327,955
52,398
1949
1959
1969
1974

FIG. 13


SOLANO COUNTY
acres
thousands)
400
300
200
100
366,717
186,378
180,339
1949
1959
1969
1974
SONOMA COUNTY
acres
(thousands)
600
500
400
300
200
100
TOTAL AGRICULTURAL
PASTURE AND RANGE
CROPLAND
514,141
423,889
90,252
1949
1959
1969
1974

uses. Based on estimates from ABAG, about 445,000 acres of the region were "urban" in 1975.[4] Even if all the urban development since 1949 had taken place on agricultural land, it would not have directly consumed the entire 595,000 acres that went out of production by 1974. How much land, then, has urban development consumed directly, and how much more is it indirectly responsible for taking out of production?

One of the studies of Santa Clara County cited in Table 4 (the one by Dill and Otte[5]) also covered five other Bay Area counties. But Dill and Otte's estimate of urban land requirements was the lowest of the Santa Clara County studies County studies examined. A 27% increase was required to bring Dill and Otte's estimate up to the level of the next lowest estimate of urban land consumption in Santa Clara County. Therefore 27% was chosen as an adjustment factor for the other counties as well to make the Dill and Otte study's results more realistic based on additional evidence. The original and adjusted estimates of urban land requirements from the Dill and Otte study are shown in Table 6.

Table 6

ACRES OF URBAN DEVELOPMENT PER 100 INCREASE IN POPULATION

County	Time Period	Original Estimate	Adjusted Est. (+27%)
Alameda	1950-1959	6.5 acres	8.3 acres
Contra Costa	1950-1959	8.2	10.4
San Mateo	1956-1964	1.2	1.5
Santa Clara	1950-1964	6.4	8.1
Solano	1952-1964	13.2	16.8
Sonoma	1953-1965	10.6	13.5
Six-County Weighted Average:			8.0 acres

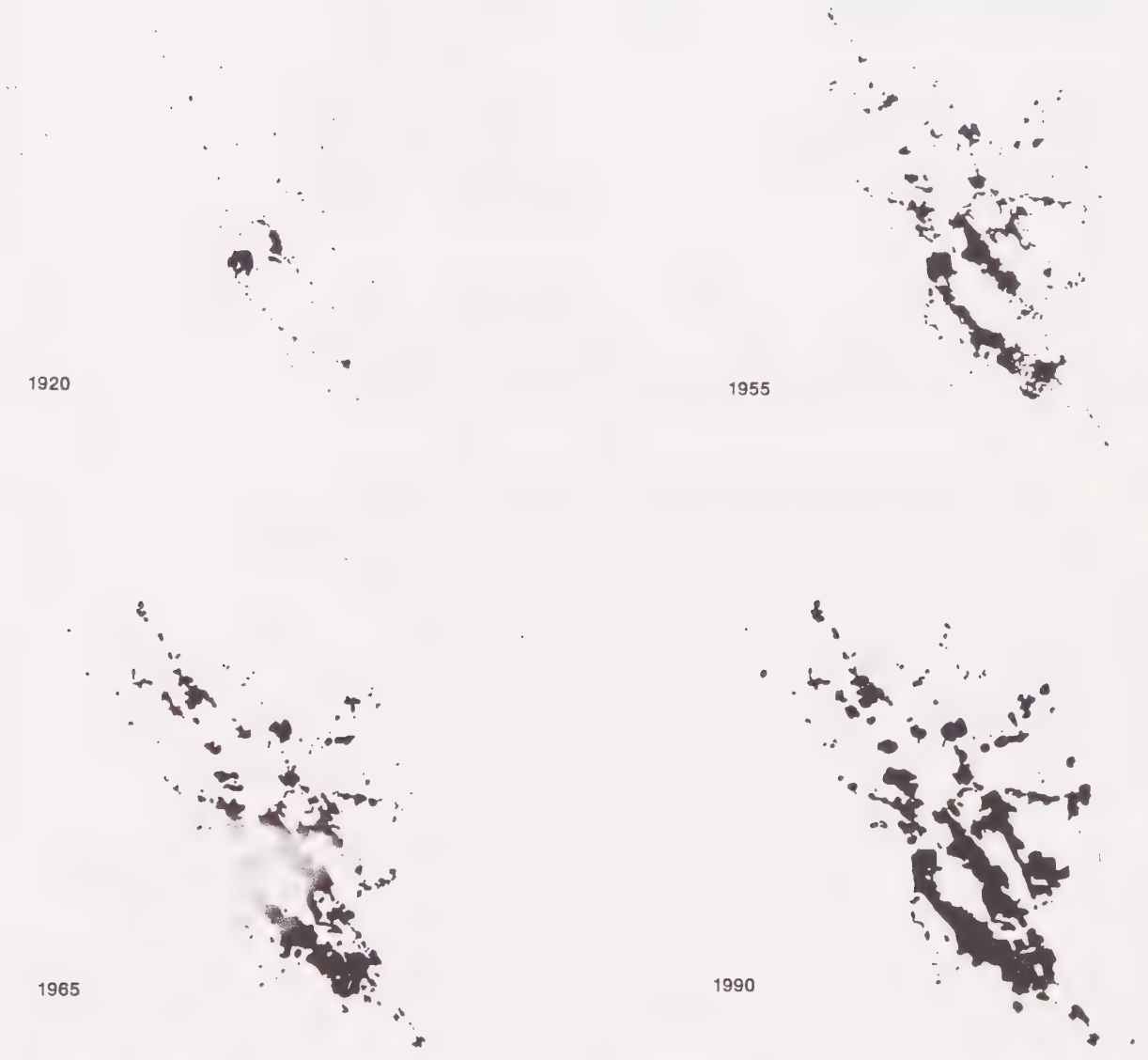
Source: Dill & Otte, 1970
Population estimates from California State Department of Finance, Population Research Unit.

The overall Bay Area average, based on the six counties for which information is available, is approximately 8 acres of urban development for every 100 increase in population during the 1950's and early 1960's. Marin and Napa Counties would probably show somewhat higher rates of urban land consumption because of their suburban nature. Their omission is not fatal to the average, however, since only about 7.5% of the region's population increase from 1949-74 occurred in those two counties (not counting San Francisco).

Assuming that urbanization in the region as a whole took place on agricultural land in the same proportion as Santa Clara County, and that the amount of land idled was also similar, then <u>each 100 increase in population would have removed about 9 acres of agricultural land from production region-wide</u>.[6]

FIG. 14

BAY AREA URBANIZATION



Source: ABAG Preliminary Regional Plan (1966)

These estimates seem reasonable, considering the fact that 40% of the region's population increase from 1950-1975 was in Santa Clara County. The region as a whole would be heavily influenced by the type of development occurring in that county. An additional 16% of the region's population increase occurred in Alameda County, where urbanization expanded at about the same per capita rate as in Santa Clara. The low rate of urban land expansion per capita in San Mateo County is offset by higher rates of expansion in Contra Costa, Solano and Sonoma Counties. Given the high rates of urban land expansion in these latter two counties and the fact that urban development was occurring primarily on agricultural land in other counties during this period (e.g. Alameda Bay plain, Contra Costa valleys), it is realistic to assume that region-wide the impact of urban development on agricultural land was at least as great as that reported for Santa Clara County.

Under these assumptions, then, about 9 of the region's 27 acres of farmland loss per 100 increase in population -- one-third of the total -- could be attributed directly to urban development. In terms of actual area, this means that 198,300 of the 595,000 acres that went out of production in the Bay Area were either developed or idled due to urban development between 1949 and 1974 and permanently removed from the agricultural land base.

Some land may also have been removed from production for reasons unrelated to urban pressures, of course. Disease, drought or changes in demand for particular crops can cause agricultural land uses to change and even cause land to be idled temporarily. Normally, however, disruption of established agricultural production patterns causes a shift in agricultural land use; for example, from one crop to another, or from cropland to pasture. In the Bay Area, where the climate is moderate and most level soils are good for agriculture, there are very few instances where agricultural land would be idled in the long-term because of inherent limitations for agriculture, as opposed to in response to urbanization pressures.

What accounts, then for the 396,700 acres of agricultural land in the Bay Area that went out of production between 1949 and 1974, but that was not urbanized or identifiably idled? Some of it was certainly retired from agriculture without being intensively developed for urban uses. In other words, this land was "functionally converted" to non-agricultural uses. Two ways in which urbanization can cause this functional (as opposed to physical) removal of land from the agricultural production base are through parcelization, and urban-related open land uses.

C. Parcelization: One-Quarter of Farmland Loss?

Almost every Bay Area County has some areas of parcelization. Unfortunately, there is little consistent information available to indicate region-wide how much agricultural land is already subdivided into small parcels and how much has been developed as rural "ranchettes." The demand for this type of housing is large, however, and there are indications that a significant part of the region's agricultural land area is "at risk." Acoording to the U.S. Census of Agriculture, almost 170,000 acres of Bay Area agricultural land was in "farms" producing less than $2,500 worth of agriucltural commodities in 1974.[7] The amount of land in these small production units is summarized in Table 7.

Table 7

FARMS AND "AGRICULTURAL OPERATIONS" PRODUCING LESS THAN $2500 IN 1974

County	Number	Acres	% of Productive Land in Farms Under $2500
Alameda	291	16,330	6.2 %
Contra Costa	364	10,970	4.4
Marin	75	7,844	5.9
Napa	374	29,105	13.9
San Mateo	81	6,245	8.8
Santa Clara	665	35,341	9.3
Solano	241	9,060	2.3
Sonoma	1,170	54,645	14.9
Bay Area	2,312	169,544	7.8

Source: U.S. Census of Agriculture, 1974

While these marginal producers encompass only about 8% of the Bay Area's farmland, they include up to 15% in some counties (e.g. Sonoma). For comparison, 170,000 acres represents more than a quarter of the land that went out of production in the Bay Area between 1949 and 1974. Furthermore, these figures represent the tip of the iceberg of land impacted by parcelization. The counties with high proportions of small producers (Sonoma, Napa, Santa Clara and San Mateo) are the same areas where non-productive rural ranchettes are most likely to be found. In the absence of better information these estimates at least suggest the magnitude of one aspect of parcelization problems and indicate the counties most likely to be affected by this form of farmland loss in the future.

D. Urban-Related Open Space: The Smallest Fraction

People living in cities need nearby open land for a number of reasons. Some open space needs require public purchase of land and may compete with agriculture for the available resource. Many public open space land uses are compatible with private agricultural activity, however, and may even help stabilize an agricultural area. The East Bay Regional Park District, for example, normally leases about 35,000 acres of parkland for cattle-grazing. The San Francisco Water District owns almost 25,000 acres of land around its reservoirs in Alameda County, much of which is used for crops and grazing. Leases on public land can comprise a significant portion of a rancher's or farmer's total operation.

Estimates of changes in publicly-owned open land in the Bay Area can be derived from various ABAG inventories of such open space. According to ABAG's inventory from 1962, there were approximately 254,597 acres in the eight agricultural Bay Area Counties owned by public agencies other than cities and counties and used for recreation or watershed protection.[8] By 1969 this had increased to about 309,734 acres.[9]

During the same period, the Bay Area's population (excluding San Francisco) increased by about 576,400, from 3,168,100 to 3,744,500.[10] This amounts to a public land increase of 9.6 acres per 100 population increase. Although this figure is likely to vary widely depending on the time period selected, there seem to have been no major public land purchases between 1962 and 1969 that would have greatly disrupted the average. Point Reyes National Park (now GGNRA) was included in both surveys, as was the land area around Lake Berryessa in Napa County. (Although Lake Berryessa itself provides water primarily for irrigation, the shoreline and reservoirs providing water for urban uses can be considered urban-related open space.)

Land acquired for public open space uses is less likely than urban development land to be agricultural, simply because many of the attributes that make land attractive for recreation or wildlife protection make it unusable or unattractive for agriculture, e.g. beaches, marshes, heavy forest and mountainous land. Nevertheless, for the detailed breakdown of parcels in the 1969 survey, approximately 20% of the publicly-owned lands in the region were still in agricultural use.[11] Assuming a total of 50% were capable of agricultural use, but not leased, only 30% of the land acquired by the public between 1962 and 1969 would have been removed from agricultural use. Under this assumption, public acquisition could account for 3 acres of the 27.0 acres of land that went out of production per 100 new people region-wide since 1949.

In light of major public land purchases that have occurred in the Bay Area since 1949, the estimate of 2.9 acres of agricultural land removed from production per 100 increase in population is conservative. Nevertheless, pending better information on exactly how much land the public has acquired since 1949, how much of it was agricultural and how much is still in agricultural use, it is a reasonable estimate. It would indicate that since 1949 region-wide 16,000 acres of land have been removed from agricultural production for public open land purposes, although three times as much agricultural land was shifted from private to public ownership.

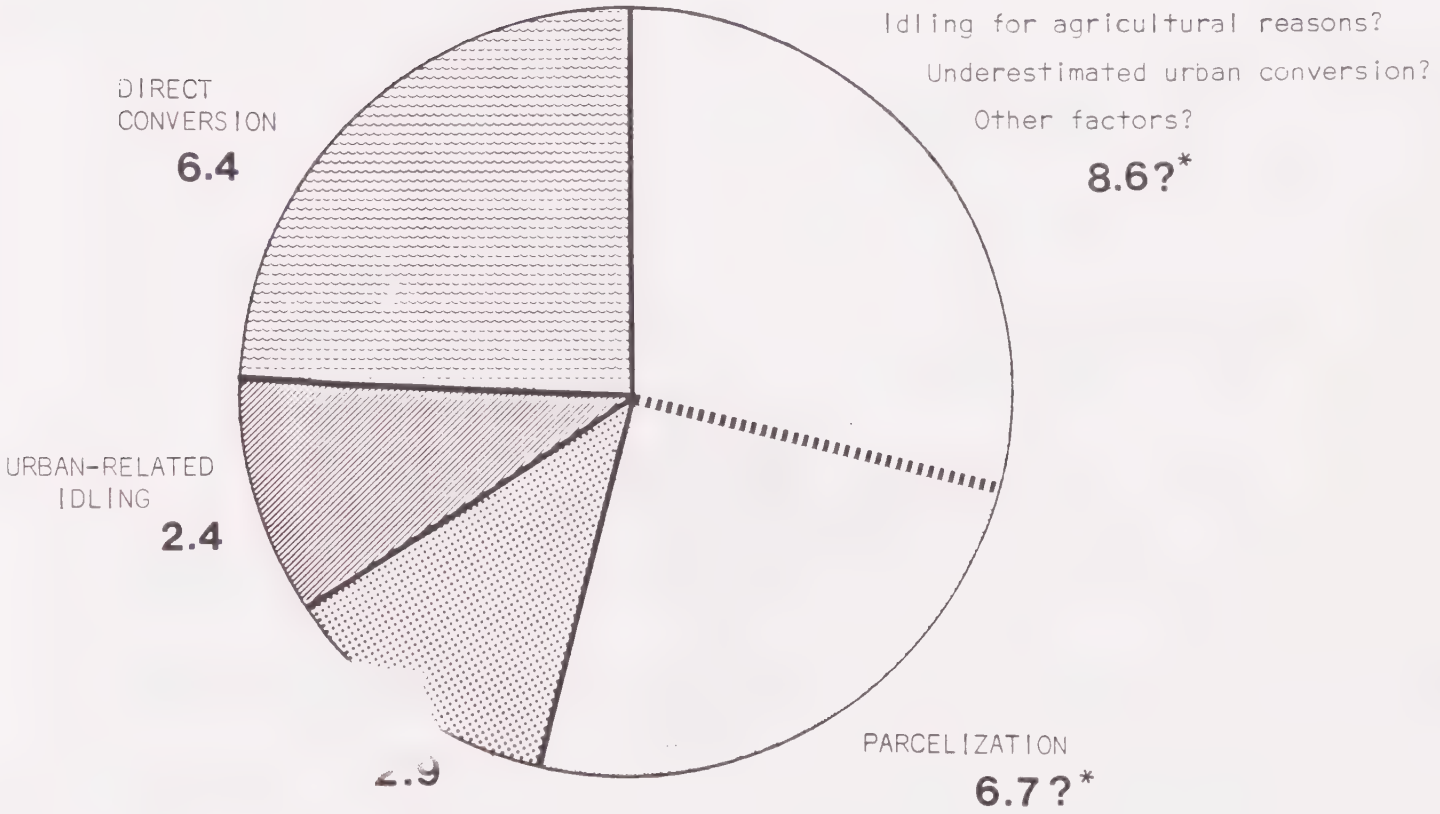
What is the significance of this type of agricultural land loss? More study of urban-related open space in the region is needed, but even if the amount of land removed from agriculture for public open space purposes is underestimated above, this type of farmland conversion is probably least significant in the Bay Area, for a number of reasons. First, almost any public agency that is able to lease land back for agricultural purposes has an economic incentive to do so. As governmental finances become tighter in the 1980's, more public land may become available for farming and ranching. Second, public open space uses are less likely than urban development to impact agricultural land.

Urban-related open space land uses could perhaps be designed and sited better to reduce potential impacts on adjacent agricultural lands. In some cases wildlife habitat provided on public lands may create problems for nearby farms and ranches. It is probably most important, however, to improve the siting and access of public developments on agricultural land. Educational facilities, hospitals, military installations and airports are often located on agricultural land, and can have needless adverse impacts on their surroundings. They may also affect local agricultural economies in negative ways.

FIG. 15

COMPONENTS OF BAY AREA FARMLAND LOSS

(ACRES/100 INCREASE IN POP.)



TOTAL AGRICULTURAL LAND LOSS 1949-1974: **27.0** ac./100 INCREASE IN POPULATION

* FIGURES ARE BEST ESTIMATES ONLY

E. The Components of Bay Area Farmland Loss: A Recapitulation

The conversion of agricultural land to urban uses is a complex process. It can take a variety of forms, not all of which are easily recognized. Of the four types of conversion identified in this report, their magnitude in the Bay Area appears to be as follows:

	Acres/100 Population Increase 27
Agricultural land that went out of production:	
1. Direct conversion -- about 24% of agricultural land loss in the region can be attributed to the actual development of urban uses.	6.4
2. Idling -- about 9% of agricultural land went out of production due to urban-related idling.	2.4
3. Parcelization -- the magnitude of this form of conversion is unknown, but it may be on the order of 25% of recent agricultural land loss.	(6.7?)*
4. Urban-related open space -- about 11% of agricultural land that went out of production in the Bay Area in recent years is now devoted to non-agricultural open space uses.	2.9
Total accounted for:	11.7

*Not included in total

Together these factors account for about 44% of the Bay Area's historical agricultural land loss, with perhaps 25% more attributable to parcelization. The remaining 30-55% of the 27 acres that went out of production per 100 increase in population may have been influenced by other factors, including some entirely unrelated to urbanization pressures. However, it is probable that some of the remaining, unaccounted for land was also in fact converted to urban uses in one of the four ways listed above. This is because the estimates are deliberately conservative in all cases. They are intended to illustrate the relative magnitude of each process and to emphasize the importance of recognizing the different types of impacts urbanization can have on agricultural land.

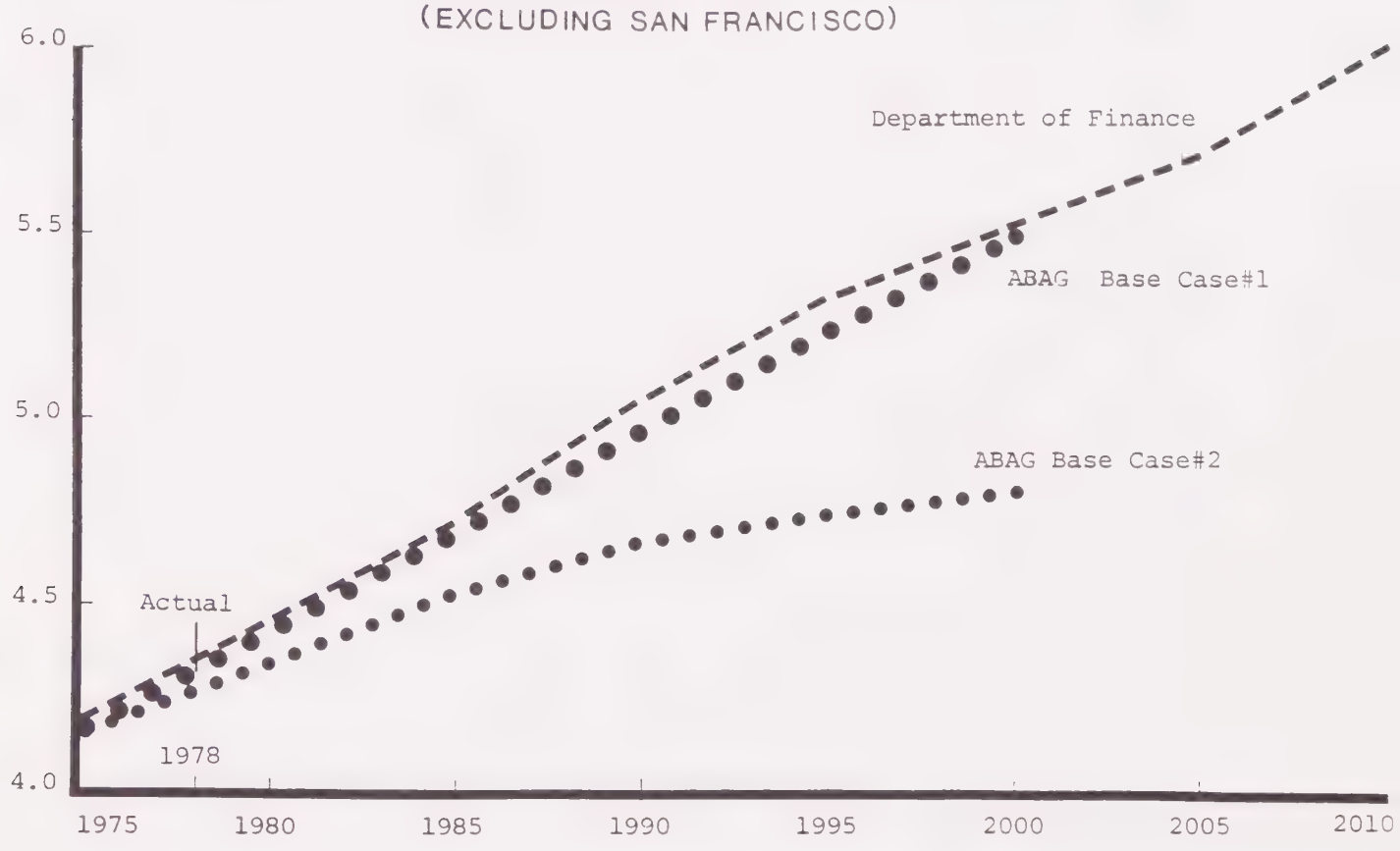
What do these estimates mean? They mean that for each 100 increase in population, the Bay Area has lost at least 12 acres of agricultural land to various forms of urbanization. This amounts to 261,800 acres of the total 595,000 acres of agricultural land lost from production.

F. The Next Thirty Years: More of the Same?

In 1970 the California Department of Water Resources projected that by 2020: "In the highly urbanized region of the San Francisco Bay . . . agriculture will be virtually eliminated by urban encroachment."[12] This is not a pleasant prospect for Bay Area residents, of course, but unless something is done to change present trends, the only point of debate in the projection may

FIG. 16

BAY AREA POPULATION PROJECTIONS
1975-2010
(EXCLUDING SAN FRANCISCO)



Source: ABAG, revised series 3 Projections, 1978.
California Department of Finance.

be the date. Since 1949 more than 1% of the Bay Area's present farmland base has gone out of production each year. To appreciate what this rate of farmland loss means, consider that if it were to continue, the Bay Area would not have a single acre left in a producing farm or ranch by the year 2073. Much of the open land would still be there, but the agricultural industry on it would, indeed, be virtually gone.

But are past trends likely to continue? The impact of urbanization on agricultural land depends both on population and on the way people are arranged on the land. As for population increase, there is no immediate sign of slackening that could relieve the pressure on agricultural land. ABAG has prepared two sets of population projections for the Bay Area. They are graphed in Figure 16 for the region as a whole, excluding San Francisco (which is not gaining resident population at present, in any case). The higher estimate almost coincides with projections prepared by the California Department of Finance for the eight agricultural counties of the Bay Area. This projection shows a steady growth in population to the year 2010 and beyond. ABAG's lower estimate shows a levelling off of population increase in about 1990. Unfortunately, the Bay Area's 1978 population (excluding San Francisco) was estimated by the Department of Finance to be 4,324,700 -- right on the upper projection line.[13] While the region's population increase may still begin to slow at some point in the future, it will be at a higher level and probably at a later date than that suggested by ABAG's Base Case 2 projections. In short, reductions in the rate of Bay Area population increase are not likely to materialized in time to save agricultural land in the region.

Projections of future urban land requirements also suggest that the pressure on Bay Area agricultural land will continue. If urbanization trends continue simply as they have in the past, then between 72,000 - 168,000 acres of land will be removed from agricultural production regionwide by 2000 through urban development, idling and urban-related open space, based on estimates made in this report and on ABAG population projections. An undetermined additional amount (perhaps 170,000 acres?) will be removed through parcelization.

ABAG's projections indicate that the region's population will probably increase to between 5.4 and 6.2 million by the year 2000, with the higher projection being most likely. To accommodate this 12-27% population increase (based on local government land use policies), ABAG projects an increase in the region's developed urban area of almost 300,000 acres -- or 64%.[14] This represents an increase in urban area of 20 to 48 acres per 100 new people -- considerably more than the 9.2 acres of existing urban development per 100 people in the region in 1975.

ABAG does not project actual agricultural land loss, but it is disturbing that its projections assume both underlying causes of agricultural land conversion -- population increase and low density urban dispersion -- to continue into the future. Although rising energy prices may prove the guiding assumptions of the projections wrong (there are certainly real questions about whether the spreading-out of urban areas can continue), and public financing constraints may restrict the ability of cities to service sprawling developments, it is too early to say that the general trend has been checked yet. What is clear is that without a significant change of direction, the loss of agricultural land in the Bay Area will probably be at least as great in the next 30 years as it has been in the past 30.

As the examples of Sonoma and Santa Clara Counties showed, simple population increase is not the most important influence on the urban consumption of agricultural land. Especially when the "multiplier effects" of idling and parcelization are considered, it is clear that the way population increase is accommodated is more significant than how much population increase occurs (within limits).

G. Conclusion: Great Potential -- And Need -- for Conservation

The fact that direct urban conversion accounts for a relatively small proportion of total agricultural land loss even in a metropolitan region like the Bay Area suggests that the potential for agricultural land conservation is great. The majority of agricultural land removed from production is not needed for urban development, even at present low densities.

Protecting the region's agricultural land would preserve for Bay Area residents the many economic and open space benefits agriculture provides. It would also avoid the many costs associated with replacing it elsewhere. The Bay Area alone cannot make a major impact on the national problem of farmland loss, but no single area can. On the other hand, farmland conservation in each area -- including the Bay Area -- is needed if the national problem is to be solved.

It is possible that the impacts of urbanization on Bay Area agriculture may be reduced in the future due to factors such as rising energy prices and municipal budget constraints. But it is by no means certain, and once the land is gone, there is realistically no way to bring it back into production. If the Bay Area's agricultural land, and its many benefits, are to be maintained for present and future generations of residents, deliberate actions must be taken to protect it. Fortunately, there are still ample opportunities for conservation of agricultural land in the Bay Area, good prospects for success, and many rewards for acting soon.

[1] U.S. Bureau of the Census. Censuses of Agriculture: 1949 - 1974. Figures adjusted to exclude non-agricultural acreage in farms, e.g. houses, woodlots, roads, barns, etc. Census estimates were used because they attempt to inventory all agricultural land, and to maintain consistency both over time and across jurisdictional boundaries. County agricultural commissioner reports, the other major source of agricultural land use statistics, focus on cropland harvested. Harvested cropland may be more or less than the actual land in use due to double-cropping, or to land left unharvested due to crop failure, poor commodity prices or other factors.

[2] The amount of farmland estimated in 1974 was influenced slightly by a change in the definition of "farm" used by the U.S. Census between 1969 and 1974. The loss of about 35,000 acres of land was due to this definitional change, which excluded parcels of 10 acres or more if they produced less than $1000 worth of product during the census year. The impact of this definitional change was not significant in individual counties.

[3] Population estimates are for the period 1950-1975, from the California Department of Finance, Population Research Unit. Estimates were not available for 1949, and 1975 estimates are more reliable than 1974 due to special censuses in many counties.

[4] ABAG. Series 3 Revised Projections. March 15, 1978. 1975 Data Base. Berkeley.
"Urban" was considered to include the following ABAG categories: Streets and Highways, Basic Acreage, Local-serving Acreage, and Residential Acreage.

[5] Dill, Henry W., Jr. and Robert C. Otte. "Urbanization of Land in the Western States." Economic Research Service. U.S. Department of Agriculture. ERS-428. 1970.

[6] Assume from Santa Clara County case study:
a. 80% of urban development was on agricultural land:
80% x 8.0 = 6.4 acres
b. For every acre of agricultural land developed, 0.37 acre was idled
Therefore: 6.4 x .37 = 2.4 acres
Total and round:
6.4 + 2.4 = 8.8
= 9 acres

[7] U.S. Census of Agriculture, 1974. "Farms" selling less than $2,500 plus "agricultural operations" selling less than $1000. Figures derived from V.1 Part 5. Table 33. pp. II-37 - 38, and County Table 1. for each County.

[8] ABAG. "An Inventory of Parks and Open Spaces of the San Francisco Bay Region." 1962. (County total open space minus county, city parks.)

[9] ABAG. "Regional Open Space Element." Berkeley, 1969. Appendis A. County totals minus city and county land and federal non-parkland. In Alameda County 23,850 acres added for San Francisco Water District lands. These were corrections and adjustments to improve comparability with the 1962 inventory.

[10] California Department of Finance.

[11] Based on estimates of agricultural leasing by major public landowning agencies.

[12] California Department of Water Resources, "Water for California: The California Water Plan Outlook in 1970." D.W.R. Bulletin 160-70. 1970. p. 41. The statement actually refers to the DWR definition of "Bay Area" which is based on the watershed and includes part of Mendocino County and excludes parts of Sonoma, Napa, Solano, Contra Costa and Santa Clara Counties.

[13] ABAG. "Revised Series 3 Projections." March, 1978. Berkeley, California.
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[14] ABAG. Series 3 Projections. Op. Cit.

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3. Rune Carlson, ABAG
4. Leo F. Cournoyer, Santa Clara Co. Water District
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17. Kathryn Zeimetz, USDA